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The Relationships Between Sleep Disturbances, Depression, Inflammatory Markers,

and Sexual Trauma in Female Veterans

by

Ellen M. Marcolongo

A dissertation submitted in partial fulfillment of the requirements for the degree of Doctor of Philosophy University of South Florida Health College of Nursing University of South Florida

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Keywords: Sexual Harassment, Sexual Assault, Pittsburgh Sleep Quality Index, Center for Epidemiologic Studies Depression Scale Copyright © 2014, Ellen M. Marcolongo

DEDICATION

I dedicate the following dissertation to my family and friends who have inspired and motivated me through this incredible journey. I love, appreciate, and thank each one of you. Most of all I dedicate this to all the hard working female veterans: thank you for your service to our country.

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ABSTRACT

The purpose of this secondary data analysis was to assess for the relationships among sleep disturbances, depressive symptoms, inflammatory markers, and sexual trauma in female veterans. This may contribute to an understanding of the physical and mental health effects of sexual trauma in female veterans. Correlational analyses were conducted to evaluate the strength of these relationships. A reported history of sexual trauma was significantly correlated with longer sleep latencies, poorer sleep efficiency, shorter sleep durations, more daytime dysfunction, and poorer overall sleep quality in female veterans. A reported history of sexual trauma was also significantly correlated with depressive symptoms including anhedonia and a negative affect in female veterans. No significant correlations were noted between inflammatory markers and a reported history of sexual trauma in female veterans. Female veterans with a reported history of sexual trauma had more trouble falling and staying asleep, had more trouble functioning during daytime hours, and had total poorer sleep quality. These veterans also appeared depressed and they found normally pleasurable activities unenjoyable. Disturbed sleep and depressive symptoms may be risk factors in the development of chronic health diseases. By assessing and treating the sleep disturbances and depressive symptoms experienced by sexually traumatized female veterans, nurses may help to prevent the development of costly and deadly chronic diseases.

CHAPTER ONE

Background

Military sexual trauma (MST) is the title used by Department of Veterans Affairs (VA) to refer to experiences of sexual assault and/or recurring, threatening sexual harassment experienced by a veteran during military service. Since 1992, the VA has developed programs related to the screening and treatment of MST and has trained staff about issues related to MST (United States Department of Veterans Affairs, National Center for PTSD, 2007). According to the VA, approximately 1 in 5 female veterans said "yes" when asked by a health care provider if he or she was a victim of MST. These data included only the rates of MST among female veterans who chose to pursue VA health care; therefore, it might have underestimated the actual rates of sexual assault and harassment experienced by women who served in the U.S. Military. (United States Department of Veterans Affairs, 2013). Victims of MST are usually 17 to 26 years old and are unmarried. Additionally, MST usually occurs during duty hours and at military work sites. Most of the offenders are military personnel. Almost half (49.1%) of MST victims from 2002 to 2003 were Caucasian followed by African American (15.9%) and Hispanic (2.2%) (Military sexual trauma, eLibrary reference materials; Kimerling, Gima, Smith, Street, & Frayne, 2007).

In this current analysis, sexual trauma was operationalized to include sexual harassment and/or sexual assault that occurred either during a participant's military or civilian life. The United States Equal Employment Opportunity Commission (EEOC) reported 11, 364 cases of sexual harassment in fiscal year 2011. Completed sexual assault accounted for more than half of the violent sexual crimes in 2010 (Planty, Langton, Krebs, Berzofsky, & Smiley-Mcdonald, 2013).

In 2009, according to the United States Department of Justice, 125,910 women in the United States were victims of sexual assault (Truman & Rand, 2009). Survivors of sexual harassment and/or assault, were reported to experience increased sleep disturbances and/or increased depressive symptoms (DeSouza & Cerqueira, 2009; Humphreys & Lee, 2009; Mason & Lodrick, 2013; O'Brien & Sher, 2013; Park, Nakata, Swanson, & Chun, 2013; Street, Stafford, Mahan, Hendricks, 2008; Suris & Lind, 2008).

Many sleep problems have been recognized in survivors of sexual trauma, including problems falling or staying asleep due to disturbing nightmares. Studies have recognized a relationship between various sleep disturbances and trauma specific to the trauma type (Kelly, Skelton, Patel, & Bradley, 2011). The literature has reported on the extent and nature of sleep disturbance associated with sexual abuse. Sexually abused women reported more insomnia issues than women without a history of sexual abuse (Steine et al., 2012). Insomnia plays a role in reports of daytime sleepiness (Shekleton, Rogers, & Rajaratnam, 2010). Difficulty sleeping and the resulting daytime sleepiness are associated with increased depressive symptoms (Ando & Kawakami, 2012; Maglione et al., 2012).

Sleep disturbances due to sexual violence are usually mediated by depressive symptoms (Rauer, Kelly, Buckhalt, & El-Sheikh, 2010; Walker, Shannon, & Logan, 2011; Woods, Kozachik, & Hall, 2010). Sexually abused women are at greater risk for increased depressive symptoms than are non-abused women (Bedi et al., 2011; Cankaya, Talbot, Ward, & Duberstein, 2012; Chandra, Satyanarayana, & Carey, 2009; Gould et al., 2012; Liu, Jager-Hyman, Wagner, Alloy, & Gibb, 2012; Rohde et al., 2008; Schoedl et al., 2010; Sciolla et al., 2011).

These women may be at risk for a variety of health problems because of depression. Research notes a relationship between elevated inflammatory markers and increased depressive symptoms (Nemeroff, & Goldschmidt-Clermont, 2012; Pozuelo et al., 2009). Additionally, studies suggest that inflammation plays a role in the development of chronic diseases like cardiovascular disease (Coggins & Rosenzweig, 2012; Celano & Huffman, 2011; Marchant et al., 2012) and/or diabetes (Arcidacono et al., 2012; Calle & Fernandex, 2012).

Statement of the Problem

Military sexual trauma refers to sexual assault and/or sexual harassment that happen during one's military life (http://www.ptsd.va.gov/public/pages/military-sexual-traumageneral.asp). According to the Centers for Disease Control and Prevention (CDC), sexual violence is a serious, preventable public health problem. The CDC divides sexual violence into three distinct categories. These include use of physical force to make a person engage in an unwanted sexual act, attempted or actual sex with an incompetent person, and/or abusive sexual contact. The CDC defines an incompetent person as a person who is not able to comprehend the nature of the act, to refuse participation, or to communicate reluctance to engage in the sexual act (Centers for Disease Control and Prevention, Division of Violence Prevention, 2012).

Sexually abused women have an increased risk of physical and mental health problems years after the initial episode, which includes more sleep disturbances and more depressive symptoms. It has been suggested that there is a bidirectional relationship between depressive symptoms and inflammation (Howren, Lamkin, & Suls, 2009; Raison & Miller., 2011). Inflammatory processes are implicated in the relationship between depression and physiological diseases. Depressive symptoms cause sickness behavior, which are associated with increased levels of cytokines like interleukin-6 (IL-6) (Howren, Lamkin, & Suls, 2009). There is limited research that explores the effects of MST on the physical and mental health of female veterans despite the fact that more women have reported being sexually harassed and/or sexually assaulted while in the military. More research on the health effects of MST should be conducted.

Statement of the Purpose

This analysis explores relationships among sleep disturbances, depressive symptoms, inflammatory markers, and sexual trauma. The purpose of this secondary data analysis is to examine data collected for a study conducted by Dr. Maureen Groer entitled Empowering Female Veterans (W81XWH-10-1-0719). Various instruments subjectively measured sleep disturbances, depressive symptoms, and sexual trauma including the Pittsburgh Sleep Quality Index (PSQI), the Center for Epidemiologic Studies (CES-D) scale, and the Sexual Harassment and Assault information survey.

Rationale for the Study

Investigating the effects of sexual trauma on sleep disturbances, depressive symptoms, and inflammatory markers in female veterans will contribute to an understanding of the physical and mental health effects of MST. Additionally the cost of caring for victims of MST is enormous. The VA spends about \$10,880 on healthcare costs per each MST survivor (Suris, Lind, Kashner, Borman, & Petty, 2004). Adjusting for inflation, this means that in 2010, the VA spent almost \$872 million dollars on sexual assault related healthcare expenditures (Service Women's Action Network, 2012). In addition, MST jeopardizes the strength, the preparedness, and morale of the U.S. military. This weakens United States national security. It is therefore imperative to investigate the potential consequences of MST to the individual and to society. This analysis adds depth to a formerly limited body of MST research. This analysis is innovative for several reasons. First, this analysis investigates the health effects of MST but it also considers a participant's civilian sexual trauma experience. Second, it examines how the frequency of a reported sexual trauma is related to the sleep quality of female veterans. Third, it investigates how the frequency of a reported sexual trauma is related to the manifestation of depressive symptoms in female veterans. Finally, this analysis measures the levels of inflammatory markers related to the frequency of sexual trauma in female veterans. This permits an objective measure of the potential health effects of sexual trauma in female veterans.

Research Questions

The specific research questions addressed in this analysis were:

Question 1: What are the significant relationships among sleep disturbances (subjective sleep quality; i.e., sleep latency, sleep duration, usual sleep efficiency) and the reported frequency of sexual trauma in female veterans?

Question 2: What are the significant relationships among depressive symptoms and the reported frequency of sexual trauma in female veterans?

Question 3: What are the significant relationships among inflammatory markers (specific markers CRP and IL-6) and the reported frequency of sexual trauma in female veterans?

Operational Definitions

The following terms were defined and utilized throughout this analysis.

1.) Sexual Trauma: For this analysis, sexual trauma was conceptualized as sexual assault and/or harassment that occurred during a participant's civilian and/or military life. The nature and the frequency of sexual trauma experienced by a participant were measured with a survey

created for the parent study called Sexual Harassment and Assault information. Sexual trauma frequencies ranged from very seldom to very frequently.

2.) Sleep Disturbance: In this analysis, a sleep disturbance was conceptualized to be any disruption in the normal sleep cycle. The PSQI subjectively measured sleep disturbances.

3.) Depressive symptoms: In this analysis, depressive symptoms were conceptualized to include a depressed affect, anhedonia, somatic complaints, and/or interpersonal concerns. Depressive symptoms were measured subjectively with the CES-D scale.

4.) Interleukin-6: in this analysis, IL-6 was conceptualized to be a cytokine produced by mononuclear phagocytes and involved in the regulation of the inflammatory response. The Millipex® Human Cytokine/Chemokine kit was used to measure IL-6 levels.

5.) C-reactive protein (CRP): In this analysis, CRP is conceptualized to be an inflammatory marker produced by the liver in response to inflammation, infection, and IL-6. An ELISA technique measured CRP levels.

Significance of the Study

The study examined the potential effects of sexual trauma on female veteran's physical and mental health. The results suggested that women who were victims of a traumatic sexual event reported increased depressive symptoms and more problems with disturbed sleep. Sleep disturbances and increased depressive symptoms resulted in increased IL-6 and CRP levels.

Elevated IL-6 and CRP levels were factors in the development of many chronic diseases. By focusing on the possible mental health effects of sexual trauma, health care professionals may be better aware of the possible long-term physical consequences of sexual trauma in female veterans. The next chapter will present the most recent literature reviewing the effect of sexual trauma on sleep quality, depressive symptoms, and inflammatory markers.

CHAPTER TWO

LITERATURE REVIEW

This chapter presents the current research on the relationships among sexual trauma, sleep disturbances, depressive symptoms, and inflammatory markers. Studies show that sexual trauma, whether military or civilian, causes depressive symptoms and sleep disturbances. Sleep disturbances related to sexual trauma produces elevations in inflammatory markers. First, the theoretical framework that guided this study will be presented. This will be followed by a review of the literature examining the relationships among sexual trauma and sleep disturbances, MST and depressive symptoms, sexual trauma and depressive symptoms, sexual trauma and inflammatory markers, and will conclude with a review of depressive symptoms and inflammatory markers.

Theoretical Framework

A modified allostatic load model guided this analysis. This model is illustrated in Figure 1. During allostasis, an organism maintains physiological stability by changing parameters of its internal environment to match them appropriately to environmental stressors. A state of responsiveness and optimum predictive changes to acclimatize to environmental demands defines allostasis (McEwen, & Stellar, 1993).

Allostatic load represents the deterioration the body experiences when repeated stressful events activate the allostatic response (McEwen & Stellar, 1993). In this analysis, the frequency of a sexual trauma is conceptualized to be the stressful event that may lead to disturbed sleep, more depressive symptoms, and an increase in inflammatory markers and this may lead to an activation of the allostatic response. The perceptions of threat and deployment of allostatic mechanisms are shaped by differences in personal experience behavior, health habits, and abuse factors that determine a person's resiliency to stress (McEwen, 1998).

In this study, IL-6 and CRP are the inflammatory biomarkers that may ultimately lead to physical and psychological health problems. C-reactive protein is produced in response to inflammation. Plasma CRP production is primarily controlled by the cytokine IL-6 (Pepys & Hirschfield, 2003). In this analysis, frequency of sexual trauma is theorized to lead to sleep that is more disturbed and increased depressive symptoms. Disturbed sleep, increased depressive symptoms, and elevated inflammatory markers may lead to chronic disease states.



Figure1. Hypothesized Theoretical Framework

Sexual Trauma and Sleep Disturbances

The following research investigated the relationship between sleep disturbances and sexual trauma. Women who have been traumatized had difficulty maintaining healthy sleep habits due to insomnia and nightmares (Duke, Allen, Rozee, & Bommaritto, 2008; Pigeon et al., 2011; Steine et al., 2012). Women sexually abused as children continued to have sleep disturbances as adults (Chapman et al., 2011; Greenfield, Lee, Friedman, & Springer, 2011; Samelius, Wijma, Wingren, & Wijma, 2010).

A cross-sectional study design employed by Duke et al. (2008) investigated the relationship of nightmares and flashbacks to the rape experiences of 34 women. Twenty-five women without sexual assault histories served as the control group. Nightmares were measured with the Nightmare Effects Survey (Krakow et al., 2000), Nightmare Frequency Questionnaire (Krakow et al., 2000), and the Flashback Frequency Questionnaire (Duke et al., 2008). The Traumatic Stress Schedule (Norris, 19 uma Symptom ere & \uparrow \uparrow Runtz, 1989) measured posttraumatic symptoms. The nares per Dep Inflam week was significantly different betwe ind non-trauma race mator Pigeon et al. (20N) employed a cross-sectional study to describe nightmares and insomnia among 121 women exposed to intimate partner sexual abuse. At the initial evaluation,

participants completed numerous self-report instruments including the Modified PTSD Symptom Scale, the Conflict Tactics Scale-2 Short, the CES-D Scale, and the Insomnia Severity Index. Inquiring about the frequency of suit Chronic nined suicidality. Any level of positive

Disea

suicidal thoughts divided the cohort into those with and without suicidality. Participants with and without depression were compared on abuse and sleep characteristics.

In this cohort of women exposed to intimate partner violence, 46% had clinically significant insomnia as indicated by a cutoff score of 10 on the Insomnia Severity Index and 32% met the definition of nightmare disturbance as conceptualized by Pigeon et al. (2011). Based on the Insomnia Severity Index classifications, 53% of the participants reported some form of significant insomnia (Pigeon et al., 2011).

Participants who met the criteria for depression tended to be significantly older and had significantly higher posttraumatic stress disorder severity scores. Additionally, they were also more inclined to have clinically significant insomnia and nightmares (Pigeon et al., 2011). A logistic regression showed that the presence of insomnia correlated significantly with depression, controlling for abuse and posttraumatic stress disorder severity with adjusted odds ratio equal to 8.64. The presence of nightmares correlated with the presence of depression controlling for abuse with adjusted odds ratio being 3.33 (Pigeon et al., 2011). In summary, after controlling for abuse and posttraumatic stress disorder, participants continued to have complaints of insomnia and nightmares.

Steine et al. (2012) used a cross-sectional study design to explore insomnia, nightmare frequency, and distress in 460 Norwegian victims of sexual abuse. The Bergen Insomnia Scale (Pallesen et al., 2008) measured daytime and nighttime symptoms of insomnia. An open-ended question from the Nightmare Frequency Questionnaire (Krakow et al., 2002) evaluated nightmare frequency. Participants provided an approximation of the number of nightmares experienced in the previous month .Evaluation of sexual abuse included questions about the type of abuse, age at first abuse episode, duration of abuse, relationship to the offender (s), and if the victim felt threatened by the offender. Sexual harassment was a significant predictor of insomnia. Significant predictors of nightmare frequency included the duration of abuse and threats of sexual abuse. Unfortunately, the authors did not specify the exact number of nightmares experienced by participants. Sexual harassment, duration of sexual abuse, and sexual abuse threats significantly predicted nightmare distress (Steine et al., 2012).

Chapman et al. (2011) conducted a retrospective cohort study of 17, 337 adults to exam the relationship between childhood sexual abuse and the chances of experiencing sleep difficulties in adulthood. Data obtained from the adverse childhood experiences study of health maintenance organization members in California analyzed sexual abuse histories. The self-report sleep difficulties evaluated if the participant ever had problems falling or staying asleep and feeling drowsy after a good night's sleep. The adjusted relative odds of difficulties falling or staying asleep were 1.3 for those with sexual abuse histories. The adjusted relative odds of being tired after sleeping were 1.2 for sexually abused participants (Chapman et al., 2011).

Greenfield et al. (2011) conducted an epidemiological study exploring the correlations between childhood sexual abuse and adult sleep disturbances. Greenfield et al. (2011) examined data from 835 participants in the National Survey of Midlife Development in the United States. Self-report measures evaluated sexual abuse in childhood and global and component indicators of sleep problems in adulthood (Greenfield et al., 2011). The PSQI measured adult sleep problems (Buysse, Reynolds, Monk, Berman, & Kupfer 1989).

Frequent physical and emotional abuse along with sexual abuse and occasional physical and emotional with sexual abuse were significantly correlated with a higher risk of total sleep pathology. Participants who reported occasional physical and emotional abuse without sexual abuse were not at a greater risk for total sleep pathology compared to participants who reported no abuse. Frequent physical and emotional abuse together with sexual abuse correlated significantly with poorer subjective sleep quality, more sleep disturbances, greater utilization of sleep medications, and more daytime dysfunction. Occasional physical and emotional abuse with sexual abuse correlated significantly with sleep onset and daytime dysfunction (Greenfield et al., 2011).

Samelius et al. (2010) utilized a cross-sectional study design to examine the lifetime prevalence of sexual abuse and psychological health problems in 6,000 adult Swedish women. The Abuse Screening Inventory mailed to 6,000 women measured sexual abuse. Additionally, the Abuse Screening Inventory included questions about depression and/or sleep disturbances. There was significant correlations noted between abuse and depression and between abuse and sleep disturbances during the previous year (Samelius et al., 2010).

In conclusion, these studies demonstrated a relationship between sexual abuses and sleep disturbances. Many women with histories of sexual abuse reported disturbed sleep due to insomnia and/or nightmares. These sleep difficulties continued several years after the sexual abuse has ceased.

Despite these conclusions, the above studies had several limitations that may have influenced the generalizability of the results. Several studies used self-report measures (Chapman et al., 2011; Greenfield et al., 2011; Samelius et al., 2010) which may have bias issues. Additionally, Chapman et al. (2011) used a retrospective study design in which participants may have had difficulties accurately remembering information. Some studies did not ask when the abuse had occurred which may have affected the results (Greenfield et al., 2011).

Being a victim of a sexual trauma may lead an increase in depressive symptoms. Research evaluating the relationship between MST and sleep is very limited and usually explores the association between MST and sleep in the context of depression (Kelly et al., 2011). The next section will examine the latest studies exploring the relationships of sexual trauma in the general population to depressive symptoms.

Sexual Trauma and Depressive Symptoms

Several studies concluded that women who were victims sexual trauma were more likely to report increased depressive symptoms compared to women without sexual trauma histories (Gelaye, Arnold, Williams, Goshu, & Berhane, 2009; La Flair, Bradshaw, & Campbell, 2012; Taft, Resick, Watkins, & Panuzio, 2009). Gelaye et al. (2009) used a cross-sectional study design to measure the risk of depression symptoms among 1,102 female undergraduate students who were victims of sexual violence. Questions adapted from the World Health Organization Multi-Country Study of Violence Against Women were employed for this study. Three items asked about sexual violence (Gelaye et al., 2009). Depression symptoms were measured with a nineitem depression module of the Patient Health Questionnaire created for depression screening and monitoring (Spitzer, Kroenke, & Williams, 1999).

Abused participants had Patient Health Questionnaire scores that were significantly higher than non-abused participants were. Compared to non-abused participants, those who had been abused were more likely to describe mild (OR=1.34), moderate (OR=2.16), moderately severe (OR=2.20) and severe (OR=1.14) depression symptoms. Compared with non-abused participants, abused participants experienced a 1.32 fold increased risk of mild depression symptoms (OR=1.32), a 1.98 fold increased risk of moderate depression (OR=1.98), and a 1.95 fold increased risk of moderately severe depression symptoms (OR=1.95) (Gelaye et al., 2009).

A longitudinal study by La Flair, Bradshaw, and Campbell (2012) evaluated the longterm correlations between sexual abuse by intimate partners and depressive symptoms in 1,438 women. Data was collected every six months. An adapted version of the Abuse Assessment Screen measured sexual abuse. The Center for Epidemiologic Studies Depression Scale short form measured depressive symptoms experienced in the past week.

Recent intimate partner abuse was significantly correlated with an increase in the CES-D Scale short form score. Women who experienced recent intimate partner abuse had significantly increased Epidemiologic Studies Depression Scale short form compared with non-abused women. The long time correlation of current intimate partner abuse and the course of depression symptoms over time indicated that intimate partner abuse significantly influenced the progression of depression symptoms over time (La Flair, Bradshaw, & Campbell, 2012).

Taft et al. (2009) investigated posttraumatic stress disorder and depressive symptom severity in 162 female rape victims with the use of a cross-sectional study design. Measures of posttraumatic stress disorder symptoms included the Clinician-Administered PTSD Scale and the Posttraumatic Stress Diagnostic Scale. Depression symptoms were assessed with the Beck Depression Inventory-2. The Structured Clinical Interview for DSM-IV was employed to compare posttraumatic stress disorder only and a comorbid posttraumatic stress disorder/depression. Sexual assault victimization was evaluated with three interview items from the High Magnitude Stressor Events Structured Interview. The Personal Beliefs and Reactions Scale measured belief disruptions that usually follow sexual assault.

A history of sexual abuse was found to be a significant factor in both the posttraumatic stress disorder only group and in the posttraumatic/depression group. A participant's trauma related beliefs following sexual assault was a significant prediction of posttraumatic stress disorder symptoms and depression symptoms. Additionally, symptoms of posttraumatic stress and depression were significantly intercorrelated (Taft et al., 2009).

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In summary, these studies confirmed that women who experienced sexual trauma of any type reported more depressive symptoms compared to women without sexual trauma histories. Additionally, women who were victims of a sexual trauma experienced depression symptoms months to years after the traumatic sexual event. Limitations of these studies included the use of retrospective self-report. Retrospective self-reports may have had problems with recall biases. The next section will review the most recent studies exploring the association between MST and depressive symptoms.

Military Sexual Trauma and Depressive Symptoms

Female veterans who were victims of a sexual trauma were more likely to report depressive symptoms compared to female veterans who did not experience a sexual trauma. Several studies explored the relationship between MST and depressive symptoms (Haskell et al., 2010; Kimerling et al., 2010; Street et al., 2008; Suris, Lind, Kashner, & Borman, 2007). Dutra et al. (2011) examined the effects of MST on depressive and posttraumatic stress disorder symptoms.

Haskell et al. (2010) examined the prevalence of MST, depressive symptoms, and posttraumatic stress disorder among male (n=1032) and female (n=197) veterans of Operation Enduring Freedom and Operation Iraqi Freedom receiving care at a VA Healthcare System. They conducted a retrospective, cross-sectional data analysis. A review of electronic medical records assessed for MST, depressive symptoms, and posttraumatic stress disorder histories. Female veterans were significantly more likely to screen positive for MST and depressive symptoms and significantly less likely to screen positive for posttraumatic stress disorder.

Kimerling et al. (2010) used a cross-sectional design to investigate MST among 125,729 deployed Operation Enduring Freedom and Operation Iraqi Freedom veterans. These veterans had obtained Veterans Health Administration primary care or mental health care. Kimerling et al. (2010) coded the data obtained from electronic medical records for MST status and for mental health diagnoses.

Military sexual trauma was reported by 15.1% of the women. Depressive symptoms (OR=2.96) and posttraumatic stress disorder (OR=3.82) were significantly more likely among women who had reported MST than among those who did not report MST. The odds of having depressive symptoms (AOR=2.64) and posttraumatic stress disorder (AOR=3.83) did not differ significantly between adjusted and unadjusted estimates (Kimerling et al., 2010).

Street et al. (2008) utilized a cross-sectional study design to investigate MST and negative mental health correlates in 2,318 women. Participants were asked about military experiences, depressive, and posttraumatic stress disorder symptoms. Self-reported experiences of sexual harassment were correlated with greater risks of depression (adjusted odds ratio=1.75). Self-reports of both sexual harassment and assault were correlated with greater risks of depression (adjusted odds ratio=4.51). Self-reported experiences of sexual harassment were correlated with a greater risk of current posttraumatic stress disorder (adjusted odds ratio=7.15) and lifetime posttraumatic stress disorder (adjusted odds ratio=7.03).

Suris et al. (2007) tested the hypothesis that women veterans with MST histories will have poorer health outcomes and poorer quality of life. They used a retrospective cross-sectional study design. Participants (n=270) were interviewed concerning their civilian and MST histories. Suris et al. (2007) collected data through structured interviews and questionnaires about quality of life, health outcomes. Three specific questions asked participants about attempted or actual sexual assault incidents. The CES-D Scale Short Form measured depression symptoms (Kohout, Berkman, Evans, & Cornini-Huntley, 1993). The prevalence of current depressive symptoms was 52.5% among those reporting MST, 37.5% among those reporting civilian sexual trauma, and 34.4% for those with no sexual trauma history. The average CES-D scale scores for the groups were significantly different. The MST group had the highest depressive symptoms, followed by the civilian sexual trauma group, and the no assault group (Suris et al., 2007).

Dutra et al. (2011) conducted a cross-sectional pilot study to examine the effect of MST and combat experiences in 54 active duty women on depressive and posttraumatic stress disorder symptoms. Within three months of returning from Iraqi deployment, participants completed the Combat Experiences Scale and the Sexual Harassment Scale of Deployment Risk and Resilience Inventory. Participants also completed the Primary Care PTSD Screen and an abbreviated version of the CES-D Scale.

When correlational analyses were conducted to evaluate the relationship between deployment-related stressors and mental health outcomes, the only significant finding was for MST and posttraumatic stress disorder. However, MST and combat exposure did not account for significant variance in participants' CES D Scale scores (Dutra et al., 2011).

In summary, these studies demonstrated that female veterans who experienced sexual trauma of any type were more likely to report more depressive symptoms as compared to female veterans without a history of sexual trauma. Additionally, female veterans who were victims of a sexual trauma continue to experience depression symptoms months to years after the traumatic sexual event. Limitations of these studies included the use of retrospective self-reports that may have had problems with recall bias. The following section will review the latest literature examining the relationship of sexual trauma to elevations in inflammatory markers.

Sexual Trauma and Inflammatory Markers

The following studies represented the most current research showing the relationship between sexual trauma and inflammatory markers. Childhood sexual abuse and the effects on inflammatory markers as these children become adults were evaluated in five recent studies (Bertone-Johnson, Whitcomb, Missmer, Karlson,& Rich-Edwards, 2012; Carpenter et al., 2010; Danese et al., 2009; Danese et al., 2008; Danese, Pariante, Caspi, Taylor, & Poulton, 2007). Bertone-Johnson et al. (2012) measured both CRP and IL-6 levels. Carpenter et al. (2010) focused on IL-6 levels. The remaining studies assessed CRP levels over a 32-year period in children who had been sexually abused (Danese et al., 2009; Danese et al., 2008; Danese et al., 2007).

Bertone-Johnson et al. (2012) conducted a retrospective study design to assess relationships between early life sexual abuse and blood levels of CRP and IL-6. Sexual abuse incidents in childhood, before age 11, and adolescence, ages 11 to 17 were obtained by selfreport in 2001. Questions on inappropriate behavior were from the Sexual Experiences Survey (Koss & Oros, 1982). Blood samples that were collected from 1996 to 1999 were analyzed for CRP andIL-6 levels in 2001, 2009, and 2010.

C-reactive protein and interleukin-6 levels were higher in women reporting sexual abuse compared to women not reporting sexual abuse. Generally, relationships were stronger for sexual abuse that happened during adolescence than for sexual abuse that occurred during childhood. Average CRP levels in women who reported unwanted touching and forced sex were significantly higher than in women who had not reported sexual abuse. Average IL-6 levels in women who reported forced sex were significantly higher than in women who reported no abuse or touching only (Bertone-Johnson et al., 2012). A cross-sectional study design was used by Carpenter et al. (2010) to explore the association between childhood sexual abuse and pro-inflammatory cytokine production. Carpenter et al. (2010) investigated IL-6 levels in response to stress in 69 healthy adults without a history of posttraumatic stress disorder or depression. Adults with a history of childhood sexual abuse (n=19) were compared to adults without a history of childhood sexual abuse (n=50).

At baseline, participants completed the Inventory for Depressive Symptoms-Self-Rated (Rush, Gullion, Basco, Jarrett, & Trivedi, 1996), the Perceived Stress Scale (Cohen, Kamarck & Mermelstein, 1983), and the Childhood Trauma Questionnaire (Bernstein et al., 2003). Acute stress was measured with the Trier Social Stress Test. Blood samples were collected 30 minutes before, at the start of the test, at 30 minutes, and at 45 minutes after participants completed the Trier Social Stress Test. Blood samples were collected the Trier Social Stress Test. Blood samples were collected the Trier Social Stress Test. Blood samples were collected the Trier Social Stress Test. Blood samples were collected the Trier Social Stress Test. Blood samples were collected via intravenous access (Carpenter et al., 2010).

Carpenter et al. (2010) found that the Childhood Trauma Questionnaire total scores were positively and significantly associated with the maximum change in the IL-6 levels during the observation period and with maximum IL-6 but not at baseline. In the abused group, there was a non-significant trend toward more depression symptoms. Greater stress induced increases in IL-6 levels were significantly associated with a history of abuse (Carpenter et al., 2010).

A 32-year prospective longitudinal study was conducted by Danese et al. (2009) to evaluate if childhood sexual abuse was associated with high CRP levels in 1,037 participants of the Dunedin Multidisciplinary Health and Development Study. Childhood sexual abuse was reported by study participants once they became adults (Caspi et al., 2002). Children who were abused were at a greater risk of elevated CRP levels at 32 years old (Danese et al., 2009). Danese et al. (2008) did a prospective longitudinal cohort study to examine if a history of childhood sexual abuse could identify a subgroup of 1,000 depressed participants with elevated CRP levels. Sexual abuse exposure was measured retrospectively at 26 years old based on participants' reports of unwanted sexual abuse before age 11. Depression diagnoses were made at age 32 using the Diagnostic Interview Schedule and DSM-IV criteria. Blood samples were collected at age 32 during a routine assessment.

Depression was associated with high CRP levels. Abused participants were more depressed than non-abused participants were. Abused participants had elevated CRP levels (Danese et al., 2008).

Danese et al. (2007) tested the lifelong relationship between childhood sexual abuse and CRP levels in 1,037 participants of the Dunedin Multidisciplinary Health and Development Study. Sexual abuse was measured at age 26 based on a history of unwanted sexual contact before 11 years of age. At age 32, participants provided a blood sample (Danese et al., 2007).

There was a significant relationship between abuse and CRP levels. Even after controlling for adult stress, CRP levels remained significantly elevated in abused children. When controlling for poor health behaviors in abused children, the relationship between CRP and sexual trauma remained significant (Danese et al., 2007).

In conclusion, these studies demonstrated that there was a relationship between sexual abuse and levels of inflammatory markers. Specifically, participants with a history of sexual abuse had elevated levels of CRP and IL-6 when compared to non-abused participants. Additionally, those who were abused had more depression symptoms than those who were not abused. Participants who were abused and depressed were found to have higher CRP levels compared to participants without a history of abuse and depression. There are weaknesses that need, however, to be considered. A weakness of the study by Bertone-Johnson et al. (2012) was the use of a retrospective design in which recall of information may be impaired. Finally, the longitudinal studies conducted by Danese et al. (2007; 2008; 2009) may have had issues with attrition which may have effect test results. The next section will review the latest research exploring the association of sleep disturbances to inflammatory markers.

Sleep Disturbances and Inflammatory Markers

The following section will review the most recent literature demonstrating the effects of sleep disturbances on CRP and IL-6 levels. Two studies evaluated the effects of sleep disturbances on CRP levels (Liukkonen et al., 2007; Van Leeuwen et al., 2009). The effects of sleep disturbances on IL-6 levels were assessed in six studies (Frey, Fleshner, & Wright 2007; Haack, Sanchez, & Mullington, 2007; Mills et al., 2007; Prather et al., 2009; Suarez, 2008; Thomas, Motivala, Olmstead, & Irwin, 2011). Finally, three studies investigated the effects of sleep difficulties on CRP and IL-6 (Dowd, Goldman, & Weinstein, 2011; Miller et al., 2009; Okun, Coussons-Read, & Hall, 2009).

Liukkonen et al. (2007) conducted a cohort study to investigate if sleep disruptions were correlated with CRP levels. C-reactive protein levels were measured in 4,011 participants (2,104 men and 1,907 women) from northern Finland. For this study, sleep disturbances were categorized as no, slight, moderate, considerable, and severe. C-reactive protein levels were collected during clinical examinations. Median CRP levels in sleep disturbance categories "no," "slight," and "moderate, considerable, and severe" were significantly correlated.

Van Leeuwen et al. (2009) used a repeated measures design to study the immunological effects of prolonged sleep restriction and subsequent recovery sleep in 13 healthy young men.

After two baseline nights of eight hours of sleep, participants slept for only four hours per night for five nights, followed by two recovery nights of eight hours of sleep. Six control subjects had eight hours of sleep per night throughout the experiment. C-reactive protein levels were measured after the baseline, sleep restriction, and recovery periods. C-reactive protein levels were significantly increased after sleep restriction. C –reactive protein levels continued to be significantly increased after the sleep recovery period.

Frey, Fleshner, and Wright (2007) conducted a repeated measures design to examine how sleep deprivation acutely affects IL-6 levels in 19 healthy men and women. Participants lived at the research center for three baseline nights followed by 40 hours of sleep deprivation and a recovery night. Participants were constantly monitored by research staff to ensure they remained awake.

Subjective stress ratings were assessed using a 100 mm visual analog scale every two hours throughout sleep deprivation. Blood samples were collected every half hour through an indwelling intravenous catheter throughout the 40 hours of sleep deprivation. Saliva samples were collected after two hours of being awake and ended after 38 hours of continuous wakefulness. Sleep deprivation significantly decreased IL-6 levels. Frey, Fleshner, and Wright (2007) suggested the findings of a significant decrease in IL-6 during 40 hours of sleep deprivation are consistent with a study conducted by Haack et al. (2002).

Haack, Sanchez, and Mullington (2007) investigated the effects of decreased sleep on peripherally circulating inflammatory mediators. Eighteen participants were randomly assigned to either 12 days of sleeping eight or four hours per night. Blood samples were drawn frequently on the baseline day and after day ten for 25 hours via an intravenous catheter. Interleukin-6 levels were significantly increased in the four-hour sleep condition over the eight-hour sleep condition.

An observational study by Mills et al. (2007) examined if inflammation is correlated with sleep quality in 124 adults. Participants' sleep was monitored for two nights with polysomnography. During the second night of sleep, a blood sample was collected at 6:00 am. IL-6 was negatively associated with sleep efficiency and percentage of stage one sleep. These were significant findings (Mills et al., 2007).

Prather et al. (2009) used a cross-sectional design study to examine the correlations of self-reported sleep quality and duration, and a calculated measure of sleep debt with the production of IL-6 among a community sample of 156 healthy adults. Blood samples were collected about two weeks after sleep assessment. Self-reported sleep quality was measure using the PSQI (Buysse et al., 1989). Pittsburgh Sleep Quality Index total score was significantly correlated with IL-6 production (Prather et al., 2009).

Suarez et al. (2008) utilized factorial design to examine if gender moderated the relation of subjective sleep and sleep-related symptoms to indices of inflammation in 210 healthy men and women. After blood samples were collected, participants completed the PSQI. A significant PSQI by gender interaction was seen for biomarkers of inflammation with the interaction significantly predicting IL-6. The PSQI score correlated significantly and positively with IL-6 in women.

Interleukin-6 levels were significantly predicted by the sleep latency component by gender and sleep disturbance component by gender interactions such that more frequent episodes of difficulty falling asleep and greater frequency of sleep disturbances were correlated with higher IL-6 levels in women. Among women, longer time to fall asleep was correlated with IL-6 levels. In conclusion, in women but not men poor sleep and sleep-related symptoms were correlated to an assortment of plasma biomarkers (Suarez, 2008).

Thomas et al. (2011) employed a cross-sectional design to study the correlation between cellular expression of pro-inflammatory cytokines and variations of sleep depth and daytime fatigue in 31 healthy men and women. Evening levels of monocyte intracellular pro-inflammatory cytokine production were measured before the evaluation of polysomnographic sleep and measures of fatigue the following day. Thomas et al. (2011) found greater evening stimulated monocyte production of IL-6 was significantly correlated with less deep sleep. Greater evening stimulated monocyte production of IL-6 was significantly associated with a longer REM interval. When both production of IL-6 and deep sleep were examined together as predictors of fatigue, only deep sleep was significantly correlated IL-6 with next day.

Dowd, Goldman, and Weinstein (2011) used a cross-sectional study design to explore the correlations between self-reported sleep characteristics and inflammation in 1020 Taiwanese adult respondents of the 2000 and 2006 Social Environment and Biomarkers of Aging Study. Regression models estimated the relationships between IL-6, CRP, and a modified PSQI, PSQI subcomponents, and self-reported sleep duration. Additionally, changes in inflammatory markers between 2000 and 2006 were used to predict sleep duration in 2006. Inflammatory markers were analyzed from overnight fasting serum samples.

Participants who reported longer sleep durations had significantly higher levels of CRP and IL-6. Increases in IL-6 between 2000 and 2006 were significantly correlated with longer sleep duration. Higher baseline levels of IL-6 significantly predicted long sleep duration six years later independent of the change in IL-6 levels (Dowd, Goldman, & Weinstein, 2011). Miller et al. (2009) used a factorial study design to examine the associations between sleep, IL-6 (n=4642), and CRP (n=4677). Data from the Whitehall II Study was used. Only white participants with complete data on sleep (n = 5100) and IL-6 (n = 4642), of whom 73% were men, and sleep data and CRP (n = 4677), of whom 73% were men were examined. Participants were asked on average how many hours they slept per night. Blood samples were collected after an overnight fast.

In men, IL-6 levels were significantly higher in long and short sleepers. No difference in CRP levels was seen in men. In women, there were no differences in IL-6 levels with any sleep categories. Women did show significant differences in CRP levels (Miller et al., 2009).

Okun, Coussons-Read, & Hall (2009) conducted a cross-sectional study to evaluate the relationship between self-reported sleep and levels of IL-6 and CRP in 43 non-pregnant women. Participants completed the PSQI (Buysse et al., 1989), The CES-D Scale (Radloff, 1977), gave a blood sample, and kept a sleep diary for two weeks. Poor sleep quality and continuity were significantly correlated with higher CRP levels. No significant relationships were observed between PSQI scores and IL-6.

In summary, these studies demonstrated that sleep disturbances were associated with elevations of CRP and IL-6. Only one study (Frey, Fleshner, and Wright 2007) found a decrease level of IL-6 after 40 hours of sleep deprivation. Frey, Fleshner, and Wright (2007) did not speculate on the cause of this; they just said that this result is similar to a previous study (Haack et al., 2002).

These studies did have several limitations that may make generalizability difficult. Many of these studies used self-report measures of sleep that were not supported with objective measures such as polysomnography (Liukkonen et al., 2007; Okun, Coussons-Read, & Hall,

2009; Prather et al., 2009; Suarez et al., 2008). Furthermore, many of these studies (Frey, Fleshner, & Wright, 2007; Haack, Sanchez, & Mullington 2007; Okun, Coussons-Read, & Hall, 2009; Thomas et al., 2011; Van Leeuwen et al., 2009) used small sample sizes further making generalizability challenging. The next section of this literature review will present recent studies exploring the relationship between depressive symptoms and inflammatory markers.

Depressive Symptoms and Inflammatory Markers

This section of this literature review will present the latest research examining the relationship between depressive symptoms and inflammatory markers. Six studies measured CRP and IL-6 levels in depression (Bremmer et al., 2008; Brummett et al., 2010; Gimeno et al., 2009; Stewart, Rand, Muldoon, & Kamarck, 2009; Vogelzangs et al., 2012; Weinstein et al., 2010). Three studies measured IL-6 levels in depression (Fagundes, Glaser, Hwang, Malarkey, & Kiecolt-Glaser, 2012; Lehto et al., 2010; Simon et al., 2008). Two studies (Morris et al., 2011; Shaffer et al., 2011) examined the relationship between depressive symptoms and CRP levels.

Bremmer et al. (2008) utilized a cross-sectional study design to evaluate the relationship between CRP and IL-6 levels in 1,285 depressed older people. The CES-D Scale (Radloff, 1977) determined levels of depression. All participants with clinically relevant depressive symptoms had a follow-up interview to determine if they had major depression. All blood samples were obtained in the morning.

Total CES-D Scale scores were significantly higher in participants with elevated CRP levels. Participants with high IL-6 levels had marginally higher CES-D Scale scores. This, however, was not statistically significant (Bremmer et al., 2008).

Brummett et al. (2010) used a factorial design to examine the effects of depression on changes in inflammatory markers in 307 men and 218 women in response to a stressor. Anger

and sadness recall protocols (Brummett, Boyle, Kuhn, Siegler, & Williams, 2009; Williams et al., 2008) were used to induce an acute stress reaction. Blood samples were obtained ten minutes into the emotional recall protocol and an hour after completion of the emotional recall protocol. The CES-D Scale measured depressive symptoms (Radloff, 1977).

Depressive symptoms by gender interaction were a significant predictor of CRP response. Depressive symptoms by gender interaction were significantly correlated to IL-6. Change in negative emotion was significantly associated with changes in CRP. Participants with increased negative emotional responses had greater CRP responses (Brummett et al., 2010).

Gimeno et al. (2009) conducted a prospective cohort study to evaluate if CRP and IL-6 predicted cognitive symptoms of depression or if the reverse is true. Participants were in the Whitehall II study. Serum CRP, IL-6 and depressive symptoms were measured at baseline and 12 years later. At baseline, 5,978 participants had CRP data available and 5,907 participants had IL-6 data available. Of these, 3,298 (IL-6) and 3,339 (CRP) also had measurements of cognitive symptoms available at baseline and at follow-up.

Levels of inflammatory markers and depression symptoms were higher in women than in men. At baseline, CRP correlated negatively and significantly with depressive symptoms in women but not men. At follow-up, the negative correlation between CRP and depression was weaker in women and there was still no correlation observed in men. For IL-6, no correlation with depression symptoms was seen in women but there was a significant, positive correlation in men. The sex interactions at follow-up were not significant (Gimeno et al., 2009).

Among men, the long- term analyses of CRP and IL-6 as predictors of depression symptoms reached significance for both. The effects were slightly weaker for women. At
baseline, depression symptoms did not predict CRP or IL-6 levels in either sex at follow-up (Gimeno et al., 2009).

Stewart et al. (2009) conducted a prospective study to explore the longitudinal relationships between depression symptoms and IL-6 and CRP levels. Participants were 263 healthy, older men and women enrolled in the Pittsburgh Healthy Heart Project. At baseline, participants completed the Beck Depression Inventory-II and had blood drawn. Approximately six years later participants attended six follow-up visits in which the Beck Depression Inventory-II was completed. Additionally, participants underwent blood draws at these follow-up visits.

Baseline IL-6, CRP, and Beck Depression Inventory-II correlated significantly and positively to their corresponding follow-up level. Baseline Beck Depression Inventory-II correlated positively and significantly with changes in IL-6 levels. Baseline Beck Depression Inventory-II was not a significant predictor of changes in CRP levels (Stewart et al., 2009).

Vogelzangs et al. (2012) used a cross-sectional study design to investigate the relationship between depression, depression symptoms, and inflammatory markers in adults with current (n=1132) or remitted (n=789) depression and 494 healthy controls. Participants were recruited from the Netherlands Study of Depression and Anxiety. During the baseline interview, the Composite Interview Diagnostic Instrument determined the presence of depressive symptoms (Vozelzangs et al., 2012). The 28-item self-report Inventory of Depressive Symptoms measured depression severity (Rush et al., 1996). Fasting blood samples of CRP and IL-6 were obtained at baseline (Vogelzangs et al., 2012).

For current depression disorders, sex interactions were significant for CRP and IL-6 levels. In men, a current depression disorder was significantly correlated with higher CRP and IL-6 levels. Men with a current depression disorder had significantly higher CRP levels compared with controls. Interleukin-6 levels were slightly higher in depressed men compared to controls (Vogelzangs et al., 2012).

Weinstein et al. (2010) used a factorial design to investigate the response of inflammatory markers to mental stress in 14 depressed and 14 non-depressed controls. The mood disorder module from the Structured Clinical Interview for DSM-IV (Weinstein et al., 2010) measured the presence or absence of major depressive disorder. The Hamilton Rating Scale evaluated the severity of depression symptoms (Hamilton, 1960). Additionally, participants completed the Beck Depression Inventory-II to measure depression severity.

Blood samples were obtained at baseline, immediately after the stress task, and a half hour after completion of the stress task via an indwelling catheter. The stress task included a five-minute anger recall task (Ironson et al., 1992; Kop et al., 2008) and a five-minute mental arithmetic task (Gottdiener et al., 1994; Kop et al., 2008). The orders of these stress tests were counterbalanced (Weinstein et al., 2010).

Mental stress caused significantly higher inflammatory responses among depressed participants as compared to controls. Additionally, a significantly delayed increase in CRP was observed at half hour post-mental stress among depressed participants compared to control participants. Separately, analyses for depressed participants found significant increases in IL-6 and CRP (Weinstein et al., 2010).

Fagundes et al. (2012) utilized a cross-sectional study design to assess the relationships between depressive symptoms and stress induced inflammation in 138 healthy adults. At the research center, baseline IL-6 levels were drawn and then participants completed the Trier Social Stress Test (Kirschbaum, Pirke, & Hellhammer, 1993). Blood was than redrawn at 45 minutes and at two hours post-stressor. The CES-D Scale measured depression symptoms. The Structured Clinical Interview for DSM-IV, non-patient version, determined a major depression diagnosis.

In general, IL-6 increased in response to the Trier Social Stress Test. There was a significant interaction between depression symptoms and time. Participants with more depression symptoms had a greater IL-6 response to the Trier Social Stress Test. Participants with more depressive symptoms had significantly IL-6 levels at 45 minutes and two hours post-stressor compared to participants with fewer depressive symptoms (Fagundes et al., 2012).

Lehto et al. (2010) conducted a cross-sectional study to examine depressive symptoms related changes in IL-6 in 416 participants. The Beck Depression Inventory measured depressive symptoms. Participants with increased depression symptoms had significantly more sleep problems and significantly higher IL-6 levels compared to non-depressed participants. There was a significant association between Beck Depression Inventory scores and IL-6 levels.

Simon et al. (2008) used a cross-sectional study design to measure IL-6 levels in 49 participants with major depressive disorder and 49 age and gender matched controls. The Structured Clinical Interview for DSM-IV confirmed depression diagnoses. There was a significant elevation in IL-6 levels in participants with major depression compared to healthy participants.

Morris et al. (2011) conducted a cross-sectional study to examine if the association between depressive symptoms and CRP levels differ by race and gender. Depressive symptoms and CRP levels were measured in 512 African American and Caucasian American participants, aged 30 to 65 years. The Beck Depression Inventory II established depressive symptoms. Additionally, 476 participants completed the PSQI. Blood samples were collected after a 12-hour fasting period (Morris et al., 2011). Caucasian women with depressive symptoms had significantly higher CRP levels compared to participants with little to no depressive symptoms. There were no differences in CRP levels by depressive symptom severity in Caucasian men or African Americans of either gender. Poorer sleep quality was correlated with higher depressive scores in all groups (Morris et al., 2011).

Shaffer et al. (2011) conducted a longitudinal study to examine if inflammation or depressive symptoms predicted changes in the other over a three-month period in 163 post-acute coronary artery syndrome adults. At baseline and at one and three moths post coronary event participants completed the Beck Depression Inventory. C-reactive protein levels were also measured at each visit.

Baseline total depressive symptom severity significantly predicted a smaller reduction in CRP levels from baseline to one month (Shaffer et al., 2011). Baseline cognitive-affective depressive symptom severity significantly predicted a decrease in CRP from baseline to one month. Baseline somatic-affective depressive symptom severity did not predict changes in CRP. C-reactive protein levels did not predict one or three month change in total, cognitive-affective, or somatic affective depressive symptom severity. Results did not differ according to gender (Shaffer et al., 2011).

In conclusion, these studies demonstrated a positive relationship between depressive symptoms and inflammatory markers. Those who reported depressive symptoms had higher levels of CRP and IL-6. Depression severity predicted an increased CRP response. The relationship between depression and inflammation was greater in women than in men. The studies did have limitations that may have affected results. 31

Many of these studies utilized cross-sectional study designs (Bremmer et al., 2012; Fagundes et al., 2012; Lehto et al., 2010; Simon et al., 2008; Vogelzangs et al., 2012) which makes establishing causality difficult. Additional weaknesses of these studies included small sample sizes (Shaffer et al., 2011; Simon et al., 2008; Weinstein et al., 2010) and healthy participants with no comparison to depressed participants (Brummett et al., 2010; Stewart et al., 2009). Weinstein et al. (2010) did not differentiate between acute or chronic depressive symptoms, which may have affected results. Finally, the participants in the study by Gimeno et al. (2009) were white professionals, which may make generalizing to other groups difficult. The following chapter of this proposal will present how participants were recruited for the primary study, how data was collected and analyzed, and the plan for data analysis.

CHAPTER THREE

METHODS

This chapter presents the research methods and procedures used in this analysis. The purpose of this secondary data analysis was to answer three research questions about the relationships among sexual trauma frequency, sleep disturbances, depressive symptoms, and inflammatory markers. The purpose of this analysis was to examine data collected for a study conducted by Dr. Maureen Groer entitled Empowering Female Veterans (W81XWH-10-1-0719). The research questions were: 1) Is there a significant relationship between sleep disturbances and the reported frequency of sexual trauma in female veterans; 2) Is there a significant relationship between sleep disturbances and the reported frequency of sexual trauma in female veterans; 3) Is there a significant relationship between depressive symptoms and the reported frequency of sexual trauma in female veterans. First, the research design is discussed. A description of the setting, sample, measurements, procedures, data management, and data analysis procedures related to the research questions follows.

Research Design

The parent study mentioned above was a cross-sectional study design. The purpose of the parent study was to conduct an investigation of biobehavioral health in female veterans. The purpose of the current study was to conduct a secondary analysis on data collected in the parent study to examine the relationships among sexual trauma frequency, sleep disturbances, depressive symptoms, and inflammatory markers in female veterans.

Setting

Participants were recruited on Veteran's Day 2011 at the Museum of Science and Industry (MOSI). Women attending the Veteran's Day event were given a recruitment flyer by volunteers at the event entrance. If a woman was interested in participating in the parent study, she was directed to appropriate research staff. Additionally, participants were recruited by emails to women veteran University of South Florida students.

Population and Sample

Seventy-eight participants consented to the parent study (W81XWH-10-1-0719). The inclusion criteria for this study were female veterans 18 to 71 years old who resided in or who were stationed within the Tampa Bay and Sarasota areas. Exclusion criteria were male gender and/or not a veteran.

Measurements

Demographics

A demographic data form summarized participants' socioeconomic statistics. This provided a description of the sample. Data collected included age, ethnicity, work status, education level, marital status, income, military service history, and health history.

Sexual Trauma

A sexual trauma questionnaire measured sexual trauma type and frequency of sexual trauma. Four questions were related to sexual harassment and/or sexual assault history. The questionnaire inquired about civilian and/or MST histories. If participants answered yes to any of the four questions a follow-up question addressed the frequency of the sexual trauma with the

use of a scaled response. The frequency responses were: very seldom (1); seldom (2); occasionally (3); frequently (4); or very frequently (5) (Groer, 2011).

Sleep Disturbances

The Pittsburgh Sleep Quality Index (PSQI) measured subjective sleep quality (Buysse et al., 1989). The instrument contained 19 self-rated questions related to a participants' sleep quality, sleep latency, sleep duration, usual sleep efficiency, sleeping medication use, and daytime dysfunction over the previous month. The 19 self-rated questions produced seven component scores, scored on 4-point scales, totaled for a global PSQI score. A global PSQI score of greater than five was able to distinguish between good and poor sleepers (Buyssee et al., 1989).

Evidence of the validity of the PSQI was supported by its ability to distinguish between patients and controls. Buyssee et al. (1989) administered the instrument to three different groups. One group consisted of good while the other two groups had poor sleepers. Total PSQI scores differed significantly between groups. Validity of the PSQI was also established with concurrent polysomnography results (Buyssee et al., 1989).

According to Buysse et al. (1989), the seven component scores of the PSQI showed evidence of reliability with a Cronbach's alpha (α) of 0.83. Furthermore, Buysse et al. (1989) documented the following reliabilities for individual PSQI items: sleep efficiency (α =0.76), subjective sleep quality (α =0.76), and sleep disturbances (α = 0.35).

Depressive Symptoms

The Center for Epidemiologic Studies Depression (CES-D) scale rated how frequently depressive symptoms occurred during the previous week. The CES-D is a 20-item instrument

that used a 4-point scale. Responses ranged from 0= rarely or none of the time (less than 1day) to 3= most or all of the time (5-7days). Measures included negative affect, anhedonia, and somatic complaints. The scores on the CES-D scale ranged from zero to sixty with higher scores indicating more severe depressive symptoms. A CES-D score of greater than or equal to 16 indicates clinical depression (Radloff, 1977).

Radloff (1977) provided evidence of the validity and reliability of the CES-D scale. Criterion validity was provided by establishing correlation patterns with other depression selfreports ,correlations with clinical ratings of depression severity, and discrimination between mentally ill patients and the general populace. Content validity of the scale was based on the clinical significance of the scale items. Evidence of construct validity was determined by previous knowledge about the theory and epidemiology of depressive symptoms.

According to Radloff (1977) the CES-D scale demonstrated evidence of reliability with a Cronbach α coefficient of about 0.85 and approximately 0.90 in a depressed population. Carleton et al. (2013) conducted several confirmatory factor analyses to examine the factorial validity of the CES-D scale. The version of CES-D scale proposed by Carleton et al. (2013) maintained factorial validity across different populations.

Inflammatory Markers

The inflammatory markers considered in this analysis were IL-6 and CRP. Venous blood sample were analyzed during the parent study at the biobehavioral laboratory at the University of South Florida College of Nursing. The Millipex® Human Cytokine/Chemokine kit (EMD Millipore corporation) measured IL-6 levels. An enzyme immunoassay technique (Human C-Reactive Protein ELISA Kit, DRG) measured CRP levels.

Procedure

Approval

The Institutional Review Board at the University of South Florida and the Telemedicine and Advanced Technology Research Center approved the Empowering Female Veterans study (W81XWH-10-1-0719). This current study analyzed de-identified data from the parent study.

Data Collection

This current analysis utilized the data set from the parent study. Recruitment of female veterans 18 to 71 years old occurred on Veteran's Day during a day of recognition at MOSI and through emails and newspaper advertisements. Interested veterans signed an informed consent with an ID number provided to each participant. Participants completed the required data sets and gave blood samples for analysis. Ongoing data collection occurred at University of South Florida, College of Nursing, biobehavioral laboratory.

Data Management

Statistical Product and Services Solutions (SPSS) version 21 was utilized for all data entry, management, and analysis in this study. To maintain participants' confidentiality, data were stored in a locked filing cabinet in a locked room. Electronic data was password protected on a secured server. Only IRB approved research team members had access to the participants' data. Results in the parent study and in the current study were reported using only de-identified data and without participant identifiers.

Data Cleaning

The following section discusses the procedures employed to address missing data. If any of the measurements had less than 5% of the data missing, the data were reanalyzed using the pair-wise deletion method (the default option in SPSS). The pairwise deletion method eliminates

the case only if it is missing data required for the specific analysis. They will still be included in any of the analyses for which they have all of the required information (Pallant, 2010).

The main sexual assault and harassment information questionnaire inquired about a history of sexual trauma. Participants responded no (0) or yes (1) to the main question. The follow-up questions asked about the frequency of the trauma. Responses ranged from one to five. If a participant said no (0) to the main question but the follow-up question had a response then the main question response was changed to yes (1) because a response to the follow-up question was indicative of a history of sexual trauma. If a participant responded yes (1) to the main question but the follow-up was blank, the group mean was placed in the missing data space. Mean group imputations were also conducted for data missing from the PSQI and the CES-D scale. Since data were normally distributed, mean group imputation is a good estimation of the population values (Donders, Van der Heijen, Stijnen, & Moons, 2006).

Data Analysis

Frequency distributions and descriptive statistics produced sample characteristics. The mean age, ethnicity, education, employment, and income of the sample were presented. Significance levels were set at a p value of less than 0.05. Data that were not normally distributed were logged transformed. Initially a Spearman correlation was conducted to see if any significant correlations existed between a reported history of sexual trauma, sleep disturbances, depressive symptoms, and/or inflammatory markers in female veterans. A Pearson correlation was then done to assess for any significant relationships between how often a reported sexual trauma occurred, sleep disturbances, depressive symptoms, and/or inflammators, and/or inflammatory markers in female veterans.

Research question #1: Is there a significant relationship between sleep disturbances (subjective sleep quality; i.e., sleep latency, sleep duration, usual sleep efficiency) and the reported frequency of sexual trauma in female veterans? The strength of relationships among sleep disturbances and a reported history of sexual trauma in female veterans were evaluated with a Spearman correlation. The strength of relationships among sleep disturbances and the severity of sexual abuse, as indicated by the reported occurrence of sexual assault and/or harassment in female veterans, were evaluated with a Pearson correlation.

Research question #2: Is there a significant relationship between depressive symptoms and the reported frequency of sexual trauma in female veterans? The strength of relationships among depressive symptoms and a reported history of sexual trauma in female veterans were evaluated with a Spearman correlation. The strength of relationships among depressive symptoms and the severity of sexual abuse, as indicated by the reported occurrence of sexual assault and/or harassment in female veterans, were evaluated with a Pearson correlation.

Research question # 3: Is there a significant relationship between inflammatory markers (specific markers CRP and IL-6) and the reported frequency of sexual trauma in female veterans? The strength of relationships among inflammatory markers and a reported history of sexual trauma in female veterans were evaluated with a Spearman correlation. The strength of relationships among inflammatory markers and the severity of sexual abuse, as indicated by the reported occurrence of sexual assault and/or harassment in female veterans, were evaluated with a Pearson correlation. The next chapter will present the results of these research questions.

CHAPTER FOUR

RESULTS

This chapter first reports the sample demographics and study variables. The Cronbach alpha reliabilities of the instruments used in this analysis are presented followed by a discussion of the relationships among sexual trauma frequency, sleep disturbances, depressive symptoms, and inflammatory markers. Results are presented according to each research question.

Participants

The sample consisted of 78 female veterans. Table 1 displays the ages and ethnicities of the participants in the sample with the mean age being 46.51 (SD=10.48). Ages ranged from 24 to 71. Over half of the participants were Caucasian (57.1%).

Table 1

Age	n	Ethnicity	n
24-29	7 (9.1%)	Caucasian	44 (57.1 %)
30-39	11 (14.3%)	African American	23 (29.9%)
40-49	26 (33.8%)	Asian/Pacific Islander	1 (1.3%)
50-59	26 (33.8%)	Hispanic	11 (14.1%)
60-71	7 (9.1%)	Mixed	3 (3.9%)
		Other	5 (6.5%)

Age and Ethnicity of Participants

Table 2 displays the highest educational level obtained by participants and the current employment status of participants. Over a quarter (27.3%) of the participants had at least a Master's degree and almost half (46.2%) of were employed full time.

Table 2

Education	n	Employment	n	
High School/GED	4 (5.2%)	Full-time	36 (46.2%)	
Vocational/Technical	2 (2.6%)	Part time	14 (17.9%)	
Some College	14 (18.2%)	Supported by other	8 (10.3%)	
Community College	14 (18.2%)	Disabled	12 (15.4%)	
University	17 (22.1%)	Retired	8 (10.3%)	
Masters	21 (27.3%)			
Doctorate	5 (6.5%)			

Educational Level and Employment Status

Finally, the annual income of the participants is shown in table 3.

Table 3

Annual Income

Income	n
Under 4,999	5 (6.4%)
5,000-14,999	7 (9.0%)
15,000-24,999	6 (7.7%)
25,000-39,999	22 (28.2%)

Table 3 Continued

Income	n		
70,000 +	22 (28.2%)		

Over a quarter of participants (28.2%) earned \$25,000 to \$39,999 per year. Furthermore, another 28.2% of participants earned \$70,000 or more per year.

Description of Study Variables

Pittsburgh Sleep Quality Index

According to Buysse et al. (1989), the seven component scores of the PSQI had a Cronbach's alpha (α) of 0.83. In this sample, the Cronbach's α for the total PSQI was 0.79. The reliability coefficients in this sample ranged from 0.76 to 0.79. Furthermore, Buysse et al. (1989) documented the following reliabilities for individual PSQI items: sleep efficiency (α =0.76), subjective sleep quality (α =0.76), and sleep disturbances (α = 0.35). The total PSQI mean score in the sample was 10.50 (SD=5.10). Buysse et al. (1989) reported that a total PSQI score of greater than five is indicative of poor sleep quality. In this current sample, 43.2% of participants reported that they had not taken any sleep medications during the previous month. The reliability coefficients and mean scores of the PSQI for this sample are displayed in table 4.

Table 4

Pittsburgh Sleep Quality Index Total and Subscale Reliability Coefficients and Mean Scores

PSQI	Cronbach α	Mean (SD)
Duration	0.77	1.26 (1.09)
Disturbances	0.76	1.87 (0.81)

Latency	0.76	1.70 (1.1
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Table 4 Continued

PSQI	Cronbach a	Mean (SD)
Daytime Dysfunction	0.76	1.64 (0.79)
Efficiency	0.79	0.98 (1.22)
Total	0.79	10.50 (5.10)

2)

PSQI= Pittsburgh Sleep Quality Index

Center for Epidemiologic Studies Depression Scale

A factor analysis by Carleton et al. (2013) suggested a new model for the CES-D scale consisting of three factors: negative affect (α = 0.92), anhedonia (α = 0.86), and somatic complaints (α = 0.80). The new factor analysis included items 3, 6, 14, and 18 for negative affect, items 4, 8, 12, and 16 for anhedonia, and items 1, 2, 5, 7, 11, 20 for somatic complaints (Carleton et al., 2013). Table 5 shows the total CES-D mean score and the CES-D subscale mean scores as well as the reliability coefficients.

Table 5

Center for Epidemiologic Studies Depression Mean Scores and Reliability Coefficients

CES-D Scale	Mean (SD)	Cronbach α	
Negative Affect	3.52 (3.71)	0.90	
Anhedonia	5.32 (4.23)	0.90	
Somatic Complaints	6.47 (4.58)	0.80	
Total	18.95 (12.29)	0.90	

CES-D= Center for Epidemiologic Studies Depression

The Cronbach's α for the total CES-D Scale was 0.90 in this analysis. The Cronbach alpha coefficient of the CES-D scale in a healthy population is about 0.85 and is approximately 0.90 in a depressed population (Radloff, 1977). The mean total CES-D scale score in this sample was 18.95 (SD=12.29). A CES -D score of greater than or equal to 16 is indicative of clinical depression (Radloff, 1977).

Sexual Harassment and Assault Questionnaire

Table 6 shows the reported sexual trauma history of participants. In summary, 70.5% (n=55) of participants reported being sexually harassed as civilians and 73.1% (n=57) said they were sexually harassed while serving in the military. A history of civilian sexual assault was reported by 37.2% (n=29) of the participants while a history of military sexual assault was reported by 34.6% (n=27) of the participants.

Table 6

Sexual Harassment and Assault	No		Yes	
	n	(%)	n	(%)
Civilian Sexual Harassment	23	(29.5%)	55	(70.5%)
Military Sexual Harassment	21	(26.9%)	57	(73.1%)
Civilian Sexual Assault	49	(62.8%)	29	(37.2%)
Military Sexual Assault	51	(65.4%)	27	(34.6%)

Sexual Harassment and Assault Questionnaire Histories

Table 7 shows for those who reported being sexually harassed how often they reported being sexually harassed ranging anywhere from very seldom to very frequently.

Table 7

Frequency of Sexual Harassment Episodes

	Civilian Sexual Harassment	Military Sexual Harassment
	n (%)	n (%)
Very seldom	6 (10.9%)	4 (7%)
Seldom	14 (25.5%)	11 (19.3%)
Occasionally	15 (27.3%)	14 (24.6%)
Frequently	13 (23.6%)	16 (28.1%)
Very Frequently	7 (12.7%)	12 (21.1%)

In summary, over a quarter of the participants (27.3%) reported occasional civilian sexual harassment. Also more than a quarter of the participants (28.1%) reported frequent military sexual harassment.

Table 8 displays how often a participant reported being sexually assaulted.

Table 8

Frequency of Sexual Assault Episodes

Civilian Sexual Assault		Childhood S	Childhood Sexual Assault		Military Sexual Assault	
	n	(%)	n	(%)	n	(%)
Very Seldom	7	(24.1%)	13	(40.6%)	6	(22.2%)
Seldom	13	(44.8%)	10	(31.3%)	8	(29.6%)
Occasionally	3	(10.3%)	1	(3.1%)	8	(29.6%)
Frequently	3	(10.3%)	6	(18.8%)	3	(11.1%)

The frequency of sexual assault episodes ranged from very seldom to very frequently being sexually assaulted. Almost half of the participants (44.8%) reported seldom civilian sexual assault. Sexual assault was reported as seldom occurring during childhood (40.6%). Over a quarter of the participants (29.6%) reported being seldom to occasionally sexually assaulted while serving in the military. Next, the relationships among childhood, civilian, and military sexual assault were analyzed.

A Chi-square test for independence indicated significant correlations among a history of childhood sexual assault, a history of civilian sexual assault (p<0.05), and/or a history of military sexual assault(p=0.03). No significant correlations were seen between a history of civilian sexual assault and a history of military sexual assault (p=0.09).

Inflammatory Markers

C-Reactive Protein and Interleukin-6

Table 9 displays the CRP and IL-6 levels.

Table 9

C Reactive Protein and Il-6 Mean Levels

	CRP (µg/ml) Mean (SD)	IL-6 (pg/ml) Mean (SD)	
Untransformed	3.94 (5.75)	2.24 (1.31)	
Transformed	0.70 (0.58)	0.30 (0.17)	
*CRP=C-reactive p	protein *IL-6= interleukin-6		

2

(7.4%)

The mean CRP level was 3.94 μ g/ml (SD=5.75 μ g/ml). Healthy adults have a CRP level in the range of 1-3 μ g/ml (Pearson et al., 2003). The data was positively skewed so it was log transformed to achieve a normal distribution. The transformed CRP had a mean level of 0.70 μ g/ml with a standard deviation of 0.58 μ g/ml.

The mean IL-6 level was 2.24 pg/ml (SD=1.31). The average minimum detectable concentration of IL-6 is 0.31pg/ml (Milliplex® Map Kit, Millipore Corporation, 290 Concord Road, Billerica, MA, 01821). The data was positively skewed so it was log transformed to achieve a normal distribution. The transformed IL-6 had a mean level of 0.30 pg/ml (SD=0.17).

Research Questions

Research question number one: What are the significant relationships among sleep disturbances (subjective sleep quality; i.e., sleep latency, sleep duration, usual sleep efficiency) and the reported sexual trauma in female veterans? A Spearman correlation was conducted to evaluate if there were any significant correlations between sleep disturbances and a history of sexual trauma. This was followed by a Pearson correlation to assess if there were any significant associations between sleep disturbances and how often a participant reported being sexually traumatized.

The results of the Spearman correlations are displayed in table 10. Significant correlations were noted between a history of civilian sexual harassment and daytime dysfunction. Of the subscales, daytime dysfunction was also significantly associated with history of civilian and with a history of military sexual assault. A history of military sexual harassment was significantly correlated with sleep duration, sleep latency, daytime dysfunction, sleep efficiency, and the total PSQI score.

Table 10

	CSH	MSH	CSA	MSA
<u>PSQI</u>				
Duration	rs=0.19	rs=0.26*	rs=0.05	rs= -0.08
Table 10 Continued				
	CSH	MSH	CSA	MSA
<u>PSQI</u>				
Duration	n=74	n=75	n=74	n=74
Disturbances	rs=0.10	rs=0.09	rs=0.17	rs= 0.15
	n=75	n=76	n=75	n=75
Latency	rs=0.17	rs=0.26*	rs=0.07	rs= 0.19
	n=74	n=75	n=74	n=74
Daytime Dysfunction	rs=0.31**	rs= 0.30*	rs=0.36**	rs= 0.29*
	n=73	n=74	n=73	n=73
Sleep Efficiency	rs= 0.15	rs=0.31**	rs=0.09	rs = -0.02
	n= 73	n=74	n=73	n=73
Total	rs= 0.21	rs=0.30*	rs= 0.21	rs=0.17
	n=74	n=75	n=74	n=74

Spearman Correlations between Sleep Quality and a History of Sexual Trauma

CSH= civilian sexual harassment, MSH= military sexual harassment, CSA= civilian sexual assault; PSQI= Pittsburgh Sleep Quality Index; * p < 0.05, ** p <0.01

The results of the Pearson correlations between sleep disturbances and reported frequency of sexual trauma are displayed in table 11. Significant correlations were noted between frequent episodes of civilian sexual harassment and more daytime dysfunction and poorer total sleep quality. Frequent episodes of military sexual harassment was also significantly associated with more daytime dysfunction and poorer total sleep quality. Additionally, frequent episodes of military sexual harassment was significantly related to longer sleep latencies. No significant correlations were noted between frequent episodes of civilian and/or military sexual assault and sleep disturbances.

Lastly, an independent-samples t-test was conducted to compare the PSQI scores for participants with and without a history of military sexual assault. There was a significant difference in daytime dysfunction scores for those with a history of military sexual assault and those without a history of military sexual assault (p = 0.04). This relationship had a moderate effect size (Eta squared= 0.06). This means that 6% of the variance in daytime dysfunction was explained by a history of military sexual assault.

Table 11

	CSH	MSH	CSA	MSA	
<u>PSQI</u>					
Duration	r= 0.25	r=0.02	r=0.17	r=0.33	
	n= 54	n=56	n=28	n=27	
Disturbances	r= 0.11	r=0.24	r= -0.14	r= 0.18	
	n= 55	n=57	n=29	n=27	
Latency	r= 0.13	r=0.35**	r=0.24	r= 0.32	

Pearson Correlations between Sleep Disturbances and Frequency of Sexual Trauma

Daytime Dysfunction	r=0.41**	r=0.32*	r=0.13	r=-0.02
	n=53	n= 55	n=27	n=26
Sleep Efficiency	r=0.02	r=0.06	r=0.19	r=0.38
	n=53	n=55	n=27	n=26
Total	r=0.31*	r=0.28*	r=0.11	r=0.26

Table 11 Continued

	CSH	MSH	CSA	MSA
<u>PSQI</u>				
Total n=54	n=56	n=28	n=27	

CSH= civilian sexual harassment, MSH= military sexual harassment, CSA= civilian sexual assault; PSQI= Pittsburgh Sleep Quality Index; * p < 0.05, ** p <0.01

Research question number two: What are the significant relationships among depressive symptoms and a history of sexual trauma in female veterans? A Spearman correlation was conducted to evaluate the relationships between depressive symptoms and a history of sexual trauma in female veterans. The results of this analysis are shown in table 12.

Table 12

Spearman Correlations between Depressive Symptoms and a History of Sexual Trauma

CSH	MSH	CSA	MSA

<u>CES-D</u>				
Anhedonia	r _s =0.06	r _s =0.09	$r_{s} = 0.11$	$r_s = 0.30^{**}$
	n= 75	n= 75	n=75	n=75
Negative Affect	$r_s = 0.21$	$r_s = 0.46^{**}$	$r_s = 0.25*$	$r_{s} = 0.22$
	n=75	n=75	n=75	n=75
Somatic Complaints	r _s =0.16	$r_s = 0.36^{**}$	r _s =0.21	$r_s = 0.11$
	n=73	n=73	n=73	n=73
Table 12 Continued				
	CSH	MSH	CSA	MSA
CES-D				
Total	r _s =0.40**	$r_{s} = 0.19$	$r_s = 0.25*$	$r_s = 0.33 * *$
	n=75	n=74	n=74	n=74

 $\overline{\text{CSH}=\text{civilian sexual harassment}}$, $\overline{\text{MSH}=\text{military sexual harassment}}$, $\overline{\text{CSA}=\text{civilian sexual}}$ assault, $\overline{\text{CES-D}=\text{Center for Epidemiologic Studies Depression Scale}$; * p < 0.05, ** p < 0.01

A Pearson correlation was then done to assess if any significant correlations existed between depressive symptoms how often a participant reported being sexually traumatized. These results are displayed in table 13.

Table 13

Pearson Correlations between Depressive Symptoms and Frequency of Reported of Sexual

Trauma

	CSH	MSH	CSA	MSA
<u>CES-D</u>				
Anhedonia	r= 0.32*	r=0.15	r=0.00	r= - 0.08

	n= 54	n= 56	n=31	n=26
Negative Affect	r= 0.10	r=0.20	r= -0.16	r= - 0.07
	n= 54	n=56	n=31	n=26
Somatic Complaints	r= - 0.01	r=0.26	r= -0.14	r= 0.00
	n= 53	n=54	n=28	n=25
Total	r=0.13	r=0.27*	r= -0.14	r= -0.14
	n=54	n=56	n=28	n=26

CSH= civilian sexual harassment, MSH= military sexual harassment, CSA= civilian sexual assault, CES-D= Center for Epidemiologic Studies Depression Scale; * p < 0.05, ** p <0.01

Significant correlations were noted between depressive symptoms and a history of reported frequent military sexual harassment and between a history of reported frequent civilian sexual harassment and feelings of anhedonia. No significant correlations were seen between how often a participant was sexually assaulted as child and depressive symptoms.

An independent-samples t-test was then done to compare depressive symptoms in participants with and without a history of military sexual assault. Significant differences were seen between anhedonia and a history of military sexual assault compared to no history of military sexual assault (p < 0.05). This relationship had a moderate effect size (eta squared = 0.11) with 11% of the variance in anhedonia explained by a history of military sexual assault. Significant differences were also noted between the total depressive score and a history of military sexual assault compared to no history of military sexual assault (p=0.02). This association had a moderate effect size (eta squared= 0.08) with 8% of the variance in the total depressive score explained by a history of military sexual assault. **Research question number three**: What are the significant relationships among inflammatory markers (CRP and IL-6) and a reported history of sexual trauma in female veterans (n=53)? These results are displayed in table 14.

Table 14

Spearman Correlations between Inflammatory Markers and a History of Sexual Trauma

Inflammatory Markers	CSH	MSH	CSA	MSA
CRP	$r_s = -0.16$	$r_s = -0.20$	$r_{s} = -0.21$	$r_{s} = 0.12$

Table 14 Continued

Inflammatory Markers	CSH	MSH	CSA	MSA
IL-6	$r_{s} = 0.20$	$r_{s} = 0.03$	$r_s = -0.13$	$r_s = -0.10$

CSH= civilian sexual harassment, MSH= military sexual harassment, CSA= civilian sexual assault, CRP= C-reactive protein, IL-6= interleukin-6

No significant correlations were seen between inflammatory markers and a reported history of sexual trauma in female veterans.

An independent-samples t-test was then conducted to compare inflammatory marker levels in participants with and without a history of military sexual assault. No significant differences were noted between CRP levels and military sexual assault history (p=0.41). Furthermore, no significant differences were seen between IL-6 levels and military sexual assault history (p=0.49).

In conclusion, a reported history of sexual trauma was significantly correlated with longer sleep latencies, poorer sleep efficiency, shorter sleep durations, more daytime dysfunction, and poorer overall sleep quality in female veterans. Therefore, female veterans with a reported history of sexual trauma had trouble falling and staying asleep leading to shorter sleep durations and subsequently more difficulty functioning during waking hours. Furthermore, a history of sexual trauma was significantly associated with a poorer sleep quality in female veterans. Participants who reported frequent sexual harassment had significantly more daytime dysfunction and poorer total sleep quality.

A reported history of sexual trauma was significantly correlated with depressive symptoms in female veterans. A history of military sexual harassment was significantly correlated with a negative affect and more somatic complaints. Therefore, participants who reported being sexually harassed while serving in the military were more likely to appear depressed and to have more symptoms that are physical. A history of civilian sexual assault was significantly correlated with a negative affect indicating that participants who reported a history of civilian sexual assault were more likely to look depressed. A history of military sexual assault was significantly correlated with anhedonia. This means that participants who said they had been sexually assaulted while serving in the military no longer found usually enjoyable activities pleasurable any more. Only a history of frequent civilian sexual harassment was significantly associated with anhedonia. No significant correlations were noted between inflammatory markers and a reported history of sexual trauma in female veterans. The next chapter will discuss the implications of these results.

CHAPTER FIVE

DISSCUSSION, CONCLUSIONS, AND RECOMMENDATIONS

This final chapter presents a synthesis of the research results with a summary of the results, a discussion of the findings, nursing implications, limitations of the current analysis, and recommendations for future studies. The purpose of the cross-sectional parent study was to conduct an investigation of biobehavioral health in female veterans. The purpose of this secondary data analysis was to examine the relationships among sexual trauma frequency, sleep disturbances, depressive symptoms, and inflammatory markers in female veterans. This analysis explored subjective sleep disturbances, subjective depressive symptoms, sexual harassment and/or assault and inflammation in female veterans.

Summary of the Study Results

This was a secondary data analysis of data collected for a study entitled Empowering Female Veterans (W81XWH-10-1-0719). The sample included 78 female veterans 18 to 71 years old who resided or who were stationed within the Tampa Bay and Sarasota areas. Initial participants completed the required questionnaires and had blood samples drawn for analysis on a day of recognition for veterans in 2011. Ongoing data collection continued through 2013 at the University of South Florida, College of Nursing, biobehavioral laboratory. The mean age of the sample was 36 years. The majority of participants were Caucasian. Over a quarter of participants had at least a Master's degree and almost half were employed full time. In the current sample, 36% of the participants said they had been sexually assaulted while serving in the military and almost 40% reported being sexually assaulted as civilians. The majority (75%) of the participants said they had been sexually harassed while serving in the military. Nearly 75% (73.3%) of the women in this sample said they had been sexually harassed as civilians.

The main findings of the three research questions included significant correlations between daytime dysfunction and sexual trauma. Significant daytime dysfunction was noted in participants reporting harassment (civilian and/or military) and/or assault (civilian and/or military). A history of military sexual harassment was significantly related to longer sleep latencies, poorer sleep efficiencies, and shorter sleep durations. Only a history of military sexual harassment was significantly associated with overall poorer sleep quality.

The relationships between sleep disturbances and how often a participant reported being sexually harassed and/or assaulted were then evaluated. A history of frequent civilian sexual harassment was significantly correlated with daytime dysfunction and poorer total sleep quality. Frequent military sexual harassment was also significantly associated with more daytime dysfunction and poorer total sleep quality. Frequent sexual assault (civilian and/or military) was not significantly associated with any sleep disturbances. Next, the relationships between a history of sexual trauma and depressive symptoms in female veterans were assessed.

A history of civilian sexual harassment was significantly correlated with increased total depressive symptoms while a history of civilian sexual assault was significantly associated with a negative affect and increased somatic complaints. Participants who reported a history of military sexual harassment had significantly more negative affects and more somatic complaints. A history of military sexual assault was significant associated with more anhedonia and more

total depressive symptoms. The correlations between how often a participant reported being sexually traumatized and depressive symptoms was then evaluated.

Frequent episodes of civilian sexual harassment were significantly correlated with increased anhedonia. A history of frequent military sexual harassment episodes was associated with more total depressive symptoms.

A correlational analysis evaluated the strength of relationships between sexual trauma and inflammatory markers in female veterans. No significant correlations were seen between a history of sexual trauma and inflammatory marker levels in female veterans. The next section will discuss the above findings in more detail.

Discussion

The median age of a female veteran in 2009 was 48 years with 19 % being black, non-Hispanic while only 7% were Hispanic. Almost 50% (47%) of female veterans had completed some college with 30% having a Bachelor's degree or higher. Most employed female veterans worked at least full time (75%) with a median household income of \$60, 300 (United States Department of Veteran Affairs, 2011).

Military sexual trauma is a significant problem in today's military. From 2006 to 2012, the Department of Defense approximated that only 16% of military sexual assault cases were reported to military authorities (United States Department of Defense, 2012). Many female veterans do not report episodes of military sexual assault. Almost half of female veterans (47%) who had been sexually assaulted while serving in the military said they were afraid of retaliation if they reported the assault while 43% had did not report because they heard about the negative experiences of others who reported military sexual assault. Military sexual trauma also includes sexual harassment incidences.

In 2012, 23% of women serving in the military reported experiencing some sort of sexual harassment during the previous year, 23% reported unwanted sexual attention, 8% experienced sexual coercion, and 47% experienced some kind of sexist behavior (Department of Defense, 2013). Sexual trauma is also an issue for women during their civilian lives. In a 2010 report by Black et al. (2011) almost 18.3% of women stated being raped and 5.6% experienced some kind of sexual violence other than rape. The United States Equal Employment Opportunity Commission reported that 83.7% women said they had been being sexually harassed (United States Equal Employment Opportunity Commission, 2011).

A modified allostatic load model guided this analysis. During allostasis, an organism maintains homeostasis by changing parameters of its internal environment to match them appropriately to environmental stressors. Allostatic load is the deterioration the body experiences when repeated stressful events activate the allostatic response (McEwen, & Stellar, 1993). In this secondary data analysis, sexual trauma was conceptualized to be a factor in disturbed sleep, increased depressive symptoms, and/or a rise in inflammatory markers. Each of these three factors may activate the allostatic response and ultimately may increase the allostatic load. Increased allostatic load has been associated with the development of chronic diseases like hypertension, hyperlipidemia (McFarlane, 2010), and diabetes (Mattei, Demissie, Falcon, Ordovas, & Tucker, 2010). In this current analysis, a history of sexual trauma was significantly correlated with more sleep disturbances.

Sleep disturbances are more prevalent in those with a history of sexual trauma than in those without a history of sexual trauma (Chapman et al., 2013; Greenfield, Lee, Friedman, & Springer, 2011; Kelly et al., 2011). Symptoms that were reported by sexually traumatized individuals included more nightmares (Boyd, Bradshaw, & Robinson, 2013; Duval, McDuff, &

Zadra, 2013) and poor sleep efficiency (Insana, Kolko, & Germain, 2012). A history of military sexual trauma was associated with longer sleep latencies and poorer sleep efficiencies (Gellis, Gehrman, Mavandadi, & Oslin, 2010).

Many studies have concluded that women who were victims sexual trauma were more likely to report increased depressive symptoms compared to women without sexual trauma histories (Gelaye, Arnold, Williams, Goshu, & Berhane, 2009; La Flair, Bradshaw, & Campbell, 2012; Taft, Resick, Watkins, & Panuzio, 2009). La Flair, Bradshaw, and Campbell (2012) concluded that these depressive symptoms continue years after the initial sexual trauma episode. Depressive symptoms are highly comorbid with PTSD and MST. Maguen et al. (2012) concluded that depression was diagnosed in 75% of women with PTSD and MST and 67% of women with PTSD but without MST. Street et al. (2008) concluded that a history of military sexual harassment and a history of military sexual assult were risk factors for increased depressive symptoms.

Disturbed sleep and depressive symptoms frequently coexist in the same person (Carney, Harris, Falco, & Edinger, 2013, Mysliwiec et al., 2013). Disturbed sleep and depressive symptoms may increase the risk of developing chronic health problems like diabetes and/or cardiovascular diseases (Altman et al., 2012; Altinbas, Guloksuz, & Oral, 2013; Bansil, Kuklina, Merritt, & Yoon, 2011; Buxton & Marcelli, 2010; Friedman, Bradley, Ruttanaumpawan, & Logan, 2010; Goldbacher, Bromberger, & Matthews, 2009; Grandner, Chakravorty, Perlis, Oliver, & Gurubhagavatula, 2014; Henskens et al., 2011; Li et al., 2012; Sabanayagam & Shankar, 2010). Short sleep duration and poor sleep quality appear to influence the prevalence, development, and control of type 2 diabetes (Cappuccio, D'Elia, Strazzullo, & Miller, 2011; Gangwisch, 2009; Lou et al., 2012; McNeil, Doucet, & Chaput, 2013; Mesarwi, Polak, Jun, & Polotsky, 2013). Rafalson et al. (2010) concluded that the odds ratio of impaired fasting glucose incidences was 3.0 among those who slept less than six hours per night compared to those who slept six to eight hours per night. The mechanism by which short sleep duration may predispose someone to develop type 2 diabetes includes the effects on neuroendocrine hormones.

It has been proposed that the down regulation of the hypothalamic-pituitary-adrenal axis may fail to happen after restricted sleep, causing an increase in evening cortisol levels (Chaput & Tremblay, 2012). Studies have noted a slower decline in cortisol levels throughout the day after restricted sleep, which causes increased cortisol levels during the afternoon and evening after the sleep restriction (Kumari et al., 2009; Omisade, Buxton, & Rusak, 2010). Increased cortisol levels in the evening have also been suggested to be related to decreased insulin sensitivity the next morning (McNeil, Doucet, & Chaput, 2013).

Additionally, increased sympathetic nervous system activation in response to a stressor, like sleep restriction, causes a short term fight or flight response, which impedes numerous longterm functions related to the maintenance of energy balance such as the release of leptin (McNeil, Doucet, & Chaput, 2013; Rafalson et al., 2010). Disturbed sleep has also been implicated as a risk factor in the development of cardiovascular disease.

Self-reported short sleep duration has been correlated with an increased risk of cardiovascular disease (Cappuccio et al., 2011; Cappuccio & Miller, 2011; Grandner et al., 2014) including hypertension (Altman et al., 2012; Kim et al., 2012; Mezick, Hall, & Matthews, 2012). Experiments have shown that short-term sleep deprivation may lead to elevated inflammation (Faraut, Boudjeltia, Vanhamme, Kerkhofs, 2012; Mullington, Haack, Toth, Serrardor, & Meier-Ewert, 2009) and elevated blood pressure (Robillard, Lanfranchi, Prince, Filipini, & Carrier, 2011). Inflammation is a risk factor for the development of cardiovascular diseases and depression is a pro-inflammatory state; therefore, those with increased depressive symptoms may be at risk to develop cardiovascular diseases (Wyman, Crum, & Celentano, 2012),

Depression was officially accepted as a risk factor for coronary heart disease in the 2010 Global Burden of Disease Study (Charlson, Stapelberg, Baxter, & Whiteford, 2011). Inflammation has been proposed as a mechanism through which depression may cause or even worsen cardiovascular disease. Inflammatory markers like CRP and IL-6 have been correlated with atherosclerosis and depression in healthy participants and in cardiac patients (Bankier, Barajas, Martinez-Rumayor, & Januzzi, 2009; Gimeno et al., 2009; Kop et al., 2010; Stewart, Rand, Muldoon, & Kamarck, 2009).

Studies have proposed both that inflammation increases depression risk (Gimeno et al., 2009; Pasco et al., 2010) and that depression causes inflammation in people with coronary heart disease (Raison & Miller, 2011). It is, therefore, difficult to decide if inflammatory markers serve as triggers of both depression and coronary vascular disease, work on the underlying pathway between them, or result from both circumstances (Elderon & Whooley, 2013). Some studies suggest that the role of inflammation in connecting depression and cardiovascular disease may be linked with the role of physical activity.

Depressed people tend to exercise less than non-depressed people, and lower activity levels have been related to increased inflammation (Hamer, Endrighi, & Poole, 2012; Hamer et al., 2012). These studies indicate that exercise and inflammation may act concurrently on the causal pathway between depression and cardiovascular disease. In a study by Duivis et al. (2011), a correlation was found between depression symptoms and subsequent inflammation was no longer significant after adjusting for health behaviors. This implies that inflammation in depression might be somewhat the result of related bad health behaviors (Duivis et al., 2011). Hamer and Molloy (2009) utilized data from the Whitehall II Cohort Study to follow 4,289 participants over 10 years. They explored the relationship between exercise and inflammatory markers CRP and IL-6. They concluded that participants who were physically active had lower baseline levels of inflammatory markers. This remained stable over 10 years of follow-up (Hamer & Molloy, 2009). This supports the importance of exercise in preventing the development of pro-inflammatory states that are related to an increased risk of cardiovascular disease. On the other hand, studies have also shown that inflammation itself may contribute to decreased exercise, implying a bidirectional association between health behaviors and inflammation (Brinkley et al., 2009; Hamer & Molloy., 2009).

In the current analysis, inflammatory markers were not significantly correlated with a history of sexual trauma. Furthermore, no significant correlations were seen between depressive symptoms and inflammatory markers. The parent study used a cross-sectional study design so follow-up of inflammatory marker levels was not done. Longitudinal studies did find significant correlations between a history of sexual trauma in childhood and/or adolescence and CRP levels in adults. (Bertone-Johnson et al., 2012; Danese et al., 2007; Danese et al., 2008; Danese et al., 2009) and/or IL-6 (Bertone-Johnson et al., 2012; Carpenter et al., 2010). Additionally, medications with anti-inflammatory properties were not controlled for in this analysis including selective serontin reuptake inhibitors (SSRIs) (Branco-de-Almeida et al., 2011; Walker 2013), statins (Antonopoulos, Margaritis, Lee, Channnon, & Antoniades, 2012; O'Neil et al., 2012; Ridker, 2013), and non-steroidal anti-inflammatory drugs (NSAIDS) (Berk et al., 2013). The following section will present the nursing implications of this analysis.

Nursing Implications

This secondary data analysis demonstrated relationships among sexual trauma, sleep disturbances, and depressive symptoms. Although these preliminary findings need to be replicated in larger, more diverse populations, the results have several important implications for nursing. Disturbed sleep and depressive symptoms may be risk factors in the development of chronic health diseases. By assessing and treating the sleep disturbances and depressive symptoms experienced by sexually traumatized female veterans, nurses may help to prevent the development of costly and deadly chronic diseases like diabetes and/or cardiovascular disease. Nurses should ask all female veterans with a sexual trauma history but may not do this because many nursing records do not contain questions about sexual trauma histories. Researchers, administrators, and practitioners should collaborate to develop nursing forms that would ask all patients about sexual trauma histories. Follow-up questions could prompt the nurse to ask sexually traumatized patient about their sleep quality and if they have any depressive symptoms. A sleep diary can be used to record the timing of sleep and wake, the quantity and the quality of sleep (Buysse, 2013). In addition, actigraphy may be used to collaborate sleep diary findings or may be used when a patient is noncompliant with a using a sleep diary (Khawaja, Hashmi, Aftab, Westermeyer, & Hurwitz, 2014).

The nurse may use information obtained from the sleep diary to ascertain patterns that may be practical goals for cognitive behavior therapy (CBT). Cognitive behavioral therapy may improve sleep and may decrease the depressive symptoms experienced by sexually traumatized female veterans. Nurses can also teach the veteran good sleep hygiene techniques including going to bed only when tired, avoiding stimulants before bedtime, limiting alcohol consumption, maintaining a consistent sleep schedule with no daytime napping, regular exercise, and keeping the bedroom dark and quiet.
Other methods nurses can review with sexual traumatized female veterans with sleep disturbances are sleep restriction therapy and/or relaxation techniques. In sleep restriction therapy, a person restricts the time they are in bed awake. They are encouraged to maintain a consistent wake up time regardless of how long they have slept. Relaxation methods nurses can teach these patients include muscle relaxation, guided imagery, and/or deep breathing (Buysse, 2013). These behavioral methods can be just as effective as pharmacological treatment for sleep disturbances (Mitchell, Gehrman, Perlis, & Umscheid, 2012). Nurses in collaboration with mental health professionals can teach effective CBT techniques for sleep disturbances in the primary setting (Jarnefelt et al., 2014). Cognitive behavioral therapy can also be used to treat depressive symptoms in sexually traumatized female veterans.

In CBT, nurses emphasize the influence current dysfunctional thoughts have on current behavior and future functioning. The goal of CBT is to evaluate, confront, and change dysfunctional beliefs. This is known as cognitive restructuring (Barth et al., 2013). Nurses can exercise an active influence over therapeutic interactions and can teach female veterans how to cope with depressive symptoms related to sexual trauma and this may also improve sleep quality in these women.

Limitations

Due to the small sample size, there may be large sample variability, which may lead to an underestimation or overestimation of the strength of relationships. Several of the correlations that approached significance may have been significant if a larger sample size was available. Furthermore, Bonferroni corrections were not conducted for the multiple corrections. The crosssectional design of the parent study did not allow for causal relationships between variables to be determined. In addition, missing data was imputed with methods including group mean substitution, which may have underestimated or overestimated the relationships among the variables. For data missing from the Sexual Harassment and Assault Information questionnaire, a dummy variable was inserted based on the available data. This may have also resulted in biased estimations.

Recommendations for Future Studies

Based upon the review of relevant studies and the current analysis, the following recommendations are made for future research.

1. Replication of the current study with a larger sample of female veterans from different regions of the country.

2. Longitudinal follow-up of female veterans who were victims of sexual trauma could reveal noteworthy patterns among sexual trauma, sleep disturbances, depressive symptoms, inflammation, and chronic disease development.

3. Future research should incorporate more frequent, subjective and objective sleep assessments to better understand the variation in sleep disturbances in female veterans reporting sexual trauma.

4. Further investigation of the underlying, biological mechanisms that lead to sleep disturbances in female veterans reporting sexual trauma should be conducted.

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Appendix 1: Institutional Review Board Approval



DIVISION OF RESEARCH INTEGRITY AND COMPLIANCE Institutional Review Boards, FWA No. 00001669 12901 Bruce B. Downs Blvd. MDC035 • Tampa, FL 336124799 (813) 9745638 • FAX (813) 9745618

December 14, 2012

Maureen Groer, RN, Ph.D. College of Nursing 12910 Bruce B. Downs Blvd. Tampa, FL 33612

RE: **Approved** Amendment Request IRB#: MS4_Pro00000229 Title: Nursing Health Initiative for Empowering Female Veterans

Dear Dr. Groer:

On 12/13/2012, the Institutional Review Board (IRB) reviewed and approved your Amendment by expedited review procedures. The submitted request has been approved **from date:** 12/13/2012 **to date:** 6/6/2013 for the following: Changes to Study Staff: Addition of Ellen Marcolongo to the study. We appreciate your dedication to the ethical conduct of human subject research at the University of South Florida and your continued commitment to human research protections. If you have any questions regarding this matter, please call 813-974-5638.

Sincerely,

Vjørgensen MD

E. Verena Jorgensen, M.D., Chairperson USF Institutional Review Board

Appendix 2: Sexual Harassment and Assault information

 Have you experienced sexual harassment (made to feel inferior, ridiculed for your gender, denied job opportunities) in your life outside the military?

Yes No If yes, how often? Very frequently Frequently Occasionally Seldom Very seldom Have you experienced sexual harassment (made to feel inferior, ridiculed for your gender, denied job opportunities) in your life in the military? Yes No If yes, how often? Very frequently Occasionally Very seldom Frequently Seldom Have you experienced sexual assault (rape, attempted rape) in your life outside the military? Yes No If yes, how often? Very seldom Very frequently Frequently Occasionally Seldom If yes, did this occur in childhood?

2.

3.

Very frequently Frequently Occasionally Seldom Very seldom Never

Have you experienced sexual assault (rape, attempted rape) in your life in the military?
 Yes
 No

If yes, how often?

Very frequently	Frequently	Occasionally	Seldom	Very seldom
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Appendix 3: Pittsburgh Sleep Quality Index

AM Subject's Initials ID# Date Time PM

PITTSBURGH SLEEP QUALITY INDEX

INSTRUCTIONS:

The following questions relate to your usual sleep habits during the past month <u>only</u>. Your answers should indicate the most accurate reply for the <u>majority</u> of days and nights in the past month.

Please answer all questions.

1. During the past month, what time have you usually gone to bed at night?

BED TIME _____

2. During the past month, how long (in minutes) has it usually taken you to fall asleep each night?

NUMBER OF MINUTES _____

3. During the past month, what time have you usually gotten up in the morning?

GETTING UP TIME _____

4. During the past month, how many hours of actual sleep did you get at night? (This may be different than the number of hours you spent in bed.)

HOURS OF SLEEP PER NIGHT

For each of the remaining questions, check the one best response. Please answer <u>all questions</u>.

5. During the past month, how often have you had trouble sleeping because you . . .

a) Cannot get to sleep within 30 minutes							
Not during the Less than		Once or twice Three or more					
past month_	once a week	a week	times a week				
b) Wake up in the r	niddle of the night	or early morning	;				
Not during the past month	Less than once a week	Once or twice a week	Three or more times a week				
c) Have to get up to	o use the bathroom						
Not during the past month	Less than once a week	Once or twice a week	Three or more times a week				
d) Cannot breathe c	comfortably						
Not during the past month	Less than once a week	Once or twice _ a week	Three or more times a week				
e) Cough or snore l	oudly						
Not during the past month	Less than once a week	Once or twice _ a week	Three or more times a week				
f) Feel too cold							
Not during the past month	Less than once a week	Once or twice a week	Three or more times a week				
g) Feel too hot							
Not during the past month	Less thanonce a week	Once or twice a week	Three or more times a week				
h) Had bad dreams							
Not during the past month	Less than once a week	Once or twice a week	Three or more times a week				
i) Have pain							
Not during the past month	Less than once a week	Once or twice a week	Three or more times a week				

j) Other reason(s), please describe

How often during the past month have you had trouble sleeping because of this?

Not during the
past month_____Less than
once a week____Once or twice
a week____Three or more
times a week____

6. During the past month, how would you rate your sleep quality overall?

Very good _____

Fairly good _____

Fairly bad _____

Very bad

7. During the past month, how often have you taken medicine to help you sleep (prescribed or "over the counter")?

Not during the
past month____Less than
once a week___Once or twice
a week___Three or more
times a week___

8. During the past month, how often have you had trouble staying awake while driving, eating meals, or engaging in social activity?

Not during the
past month____Less than
once a week___Once or twice
a week___Three or more
times a week___

9. During the past month, how much of a problem has it been for you to keep up enough enthusiasm to get things done?

No problem at all _____

Only a very slight problem _____

Somewhat of a problem _____

A very big problem ______ 10. Do you have a bed partner or room mate?

No bed partner or room mate _____

Partner/room mate in other room

Partner in same room, but not same bed _____

Partner in same bed _____

If you have a room mate or bed partner, ask him/her how often in the past month you have had . . .

a) Loud snoring

Not during the past month	Less than once a week	Once or twice a week	Three or more times a week				
b) Long pauses between breaths while asleep							
Not during the past month	Less than _once a week	Once or twice a week	Three or more times a week				
c) Legs twitching or jerking while you sleep							
Not during the past month	Less than _once a week	Once or twice _ a week	Three or more times a week				
d) Episodes of disorientation or confusion during sleep							
Not during the past month	Less than once a week	Once or twice a week	Three or more times a week				
e) Other restlessness while you sleep; please describe							
Not during the past month	Less than once a week	Once or twice a week	Three or more times a week				

Buysse DJ, Reynolds CF, Monk TH, Berman SR, Kupfer DJ: <u>Psychiatry Research</u>, 28:193-213, 1989.

Appendix 4: Center for Epidemiologic Studies Depression Scale

Center for Epidemiologic Studies Depression Scale (CES-D), NIMH

Below is a list of the ways you might have felt or behaved. Please tell me how often you have felt this way during the past week.

1. I was bothered by things that don't usually bother me.

- C Rarely or none of the time (<1 day)
- ^C Some or a little of the time (1-2 days)
- Cccasionally or a moderate amount of the time (3-4 days)
- ^C Most or all of the time (5-7 days)

2. I did not feel like eating; my appetite was poor.

- C Rarely or none of the time (<1 day)
- • Some or a little of the time (1-2 days)
- ^O Most or all of the time (5-7 days)
- 3. I felt that I could not shake off the blues even with the help of my family or friends.
 - Rarely or none of the time (<1 day)
 - ^C Some or a little of the time (1-2 days)
 - ^C Occasionally or a moderate amount of the time (3-4 days)
 - ^C Most or all of the time (5-7 days)
- 4. I felt that I was just as good as other people.
 - C Rarely or none of the time (<1 day)
 - \square Some or a little of the time (1-2 days)
 - • Occasionally or a moderate amount of the time (3-4 days)

• ^O Most or all of the time (5-7 days)

5. I had trouble keeping my mind on what I was doing.

- • Rarely or none of the time (<1 day)
- • Some or a little of the time (1-2 days)
- ^C Occasionally or a moderate amount of the time (3-4 days)
- ^C Most or all of the time (5-7 days)

6. I felt depressed.

- \square Rarely or none of the time (<1 day)
- ^C Some or a little of the time (1-2 days)
- Cccasionally or a moderate amount of the time (3-4 days)
- Most or all of the time (5-7 days)

7. I felt everything I did was an effort.

- C Rarely or none of the time (<1 day)
- Some or a little of the time (1-2 days)
- Occasionally or a moderate amount of the time (3-4 days)
- Most or all of the time (5-7 days)

8. I felt hopeful about the future.

- C Rarely or none of the time (<1 day)
- [©] Some or a little of the time (1-2 days)
- Cccasionally or a moderate amount of the time (3-4 days)
- ^C Most or all of the time (5-7 days)

9. I thought my life had been a failure.

- C Rarely or none of the time (<1 day)
- ^C Some or a little of the time (1-2 days)
- Cccasionally or a moderate amount of the time (3-4 days)
- ^C Most or all of the time (5-7 days)

10. I felt fearful.

- • Rarely or none of the time (<1 day)
- ^C Some or a little of the time (1-2 days)
- Cccasionally or a moderate amount of the time (3-4 days)
- ^O Most or all of the time (5-7 days)

11. My sleep was restless.

- C Rarely or none of the time (<1 day)
- ^C Some or a little of the time (1-2 days)
- Cccasionally or a moderate amount of the time (3-4 days)
- ^C Most or all of the time (5-7 days)

12. I was happy.

- C Rarely or none of the time (<1 day)
- ^C Some or a little of the time (1-2 days)
- ^O Occasionally or a moderate amount of the time (3-4 days)
- ^C Most or all of the time (5-7 days)

13. I talked less than usual.

- C Rarely or none of the time (<1 day)
- Some or a little of the time (1-2 days)
- ^C Occasionally or a moderate amount of the time (3-4 days)
- ^C Most or all of the time (5-7 days)

14. I felt lonely.

- \bigcirc Rarely or none of the time (<1 day)
- ^C Some or a little of the time (1-2 days)
- Cccasionally or a moderate amount of the time (3-4 days)
- Most or all of the time (5-7 days)
15. People were unfriendly.

- • Rarely or none of the time (<1 day)
- ^C Some or a little of the time (1-2 days)
- Cccasionally or a moderate amount of the time (3-4 days)
- ^O Most or all of the time (5-7 days)

16. I enjoyed life.

- C Rarely or none of the time (<1 day)
- \bigcirc Some or a little of the time (1-2 days)
- Cccasionally or a moderate amount of the time (3-4 days)
- ^C Most or all of the time (5-7 days)

17. I had crying spells.

- C Rarely or none of the time (<1 day)
- \bigcirc Some or a little of the time (1-2 days)
- ^C Occasionally or a moderate amount of the time (3-4 days)
- ^C Most or all of the time (5-7 days)

18. I felt sad.

- C Rarely or none of the time (<1 day)
- ^C Some or a little of the time (1-2 days)
- Occasionally or a moderate amount of the time (3-4 days)
- Most or all of the time (5-7 days)

19. I felt that people disliked me.

- C Rarely or none of the time (<1 day)
- ^C Some or a little of the time (1-2 days)
- ^C Occasionally or a moderate amount of the time (3-4 days)
- Most or all of the time (5-7 days)

20. I could not get "going".

- C Rarely or none of the time (<1 day)
- • Some or a little of the time (1-2 days)
- Occasionally or a moderate amount of the time (3-4 days)
- ^O Most or all of the time (5-7 days)

SCORING: zero for answers in the first column, 1 for answers in the second column, 2 for answers in the third column, 3 for answers in the fourth column. The scoring of positive items is reversed. Possible range of scores is zero to 60, with the higher scores indicating the presence of more symptomatology.

ABOUT THE AUTHOR

Ellen Marcolongo was born and raised in Philadelphia, PA. She received her nursing diploma in 1992 from Northeastern Hospital School of Nursing. After the sudden death of her mother, she made the commitment to continue her education while working full-time and while raising a daughter. She received her Bachelor's degree from Thomas Jefferson University and her Master's degree from Drexel University. She obtained her acute care nurse practitioner certification in 2002. In 2004, she moved to Saint Augustine, Florida where she was the in house nurse practitioner at a local nursing home. In addition to providing direct patient care, she also had many administrative responsibilities. In 2005, she moved to the Tampa Bay area where she began work at Your Care Clinics in Saint Petersburg, Florida as a nurse practitioner specializing in internal medicine. She currently lives in Saint Petersburg, Florida with her two cats, Bob and Dylan. In her spare time she loves to read and spend time with friends.